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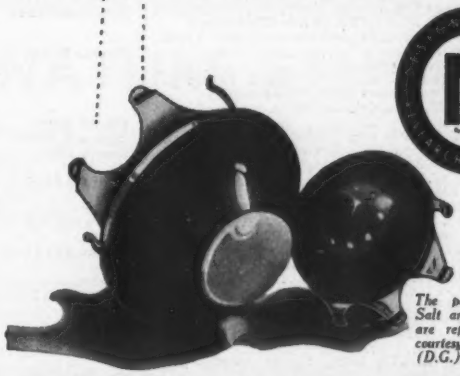

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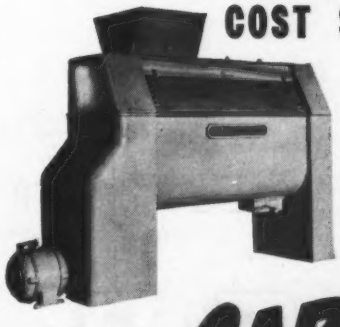

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Dealing with the Manufacture, Uses and Potentialities of Plastic Materials.

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Vol. III. No. 30 NOVEMBER, 1939

Plastics

Dealing with the Manufacture, Uses and Potentialities of Plastic Materials

Proprietors - - TEMPLE PRESS LIMITED
Managing Director - ROLAND E. DANGERFIELD

Editor - - M. D. CURWEN, B.Sc., A.I.C.
Offices - Bowling Green Lane, London, E.C.1

The Radio Cabinet Redivivus

THREE months ago we trudged round the Radio Exhibition at Olympia with leaden or, at least, only lightly silver alloyed leaden hearts. After a preliminary inquiry amongst the radio manufacturers we had come to the conclusion that they were to withdraw many plastic cabinets. So it proved. There were not many, for the great majority were of wood, and we left pondering over the fickleness of the British public and Brinell hardness of the radio manufacturers' hearts.

Now we have it on unimpeachable authority that a famous firm of radio manufacturers and "moulders in their own right" have laid it down that the majority of cabinets for the duration will be of plastics.

There is little doubt, we believe, that the radio industry is in for a busy time. The news items throughout the day have become of such importance that what might be regarded as luxury trade easily affected by war has become an industry of the first importance in disseminating news. In these dismal black-outs it is the home that has now become the centre of what amusement there may be available, and the radio ranks foremost in that capacity. Added to which it has been strongly rumoured that it is the Government's intention to provide receivers to the troops, so that not only news from the home front can reach them, but also that they may be provided with recreation in their leisure hours in reserve and in rest. To sum up, there will be created a still wider market which will benefit the industry considerably.

The radio industry, then, will have to think clearly and quickly, for wood is now no longer a matter of free import. All timber is controlled, the greatest demand being for the construction of aeroplanes, and it can only be obtained under licence. So it would appear likely that the plastic radio cabinet will be much to the fore again. If this is so, then it will be interesting to follow the life of the war-time cabinet. Some radio manufacturers have long moulded their own cabinets, others farmed out the jobs to the few large moulders who were capable of dealing with large moulds. All the moulds are in existence, of course, and it would probably be considered unwise to introduce new designs at a time when mould manufacture is slow. Those manufacturers who have never considered plastics at all would be in some difficulty. It is also possible, since the small receiver would be considered suitable, that the cast resin cabinet would prove acceptable to the British public.

It would be interesting, too, to see if an effort to introduce more colour would prove successful. Certainly our days and evenings would be rendered happier.

Oh, for a Carbide Factory

NEARLY two years ago, about the time when the rearmament scheme was created, there was considerable agitation in this country for the erection of carbide factories. There is, we believe, one tiny factory already in existence, but practically all we need for welding and metal cutting, about 60,000 tons annually, comes from abroad, from Scandinavia, Canada and so on. The curious situation is that the British Oxygen Co., Ltd., acquired control, we believe, some years ago of the Odda works, in Scandinavia, but little has been done in this country to approach the problem, although the British Government did consider the establishment of carbide plants in Wales and Scotland. What has resulted we do not know. The plastics industry has heard nothing.

Apart from the fact that the whole of the vast engineering industries in war time depend on the stocks of carbide we have or the amount that can be imported, the plastics industry is intensely interested in this material. For from carbide we make acetylene, and from acetylene an important number of rubber-like substances.

We make no fantastic claims for synthetic rubber to the detriment of natural rubber. Synthetic rubber will never oust natural rubber for general purposes, and for the well-being of the Empire and ourselves it is better so. But synthetic rubber, as we have so often reiterated, is an improvement on natural rubber in many applications, and while in peace time there is no necessity to produce it here if we can import it economically, there can be little doubt that its absence during war time can become more than irksome. Practically all rubber-like substitutes, with the exception, we believe, of Polythene, come from abroad—Neoprene from America, the Alvars and Gelvas from Canada, and

Mipolam and Koroseal from Germany and America respectively. Mipolam does not now arrive at all, the others in driblets and at long intervals, depending on the formation of convoys.

We cannot say that our industries would be totally disorganized if they did not come at all. That would be an unwarranted exaggeration. We can always return to rubber even in the special applications in which they are used at present. A cable does not rot in ten minutes because it is made of rubber. But the improvement in the cable is considerable if the synthetic type is used, and a good many industries are temporarily thrown out of gear owing to the scarcity of these new materials. Certainly the Government collared all the existing material there was, so they must have thought well of it.

Now is the time, then, for a serious consideration of the matter. Carbide made in this country would save transport from abroad. It would satisfy some of the demands of the welding industry or introduce a powerful chemical industry in case of need. Plastics from acetylene, acetic acid from acetylene, and alcohol from acetylene—a very attractive list to have as a stand-by. Not only are the chemists available for such production, but there are ample numbers of workers in the country who are completely *au fait* with the rubber-like plastics to make them into finished goods.

Formaldehyde

AS we have indicated elsewhere, there seems to be some perturbation as to a possible shortage of formaldehyde or rather a shortage of the methyl alcohol from which it is made, the reason being that it is feared that demands of methyl alcohol increase enormously during war time and that the plastics industry may get the thin end of the stick if supplies are curtailed.

How far this is true we have yet no means of judging. The works of Imperial Chemical Industries produce large quantities, and although we have not gone into the situation from the wood-distillation end, some is still being produced by this means. It is probably true, however, that the advent of synthetic methyl alcohol, such as is produced by I.C.I., Ltd., did spell the death-knell for a good many works which produced pyroligneous acid by dry distillation of wood and thence extracted the methyl alcohol that was contained therein.

Whatever the reason for a fear of a shortage, there are obviously two means open. First, to expand the synthetic manufacture and secondly, to expand wood-distillation. The first may not be a reasonable means even as a war measure. The plant is costly and the process must be carefully controlled by experts throughout its life, although these are available.

The second may be considered a reasonable procedure under certain conditions. The plant is by no means complicated nor expensive—as a means of producing methyl alcohol only, it is not as efficient as the synthetic process. But it does promise a fairly simple and rapid method of production. In addition to methyl alcohol, acetic acid and many other valuable products are made at the same time.

We mention this method especially now because there are available large quantities of waste wood in the form of chips and sawdust at all wood-working factories, some of which are very centralized, allowing for easy collection. Indeed, in almost every respectably sized factory there is a suction plant over every saw and plane in the place. Some 12 years ago we were fortunate enough to visit a works which is typical of what can be done if energy and foresight are used. The works of J. Gerrard and Co., of Swinton, Manchester, is, or certainly was then, famous among wood-workers. As mentioned, every wood-working machine had its suction plant and the chips and sawdust were sucked to a central station and then conveyed to a special wood-waste retort. Here the wood was heated, the gas evolved was returned to heat the retort and condensable liquors collected in a tank. This pyroligneous acid was further treated to separate the valuable constituents it contained and were sold to the large textile industry that existed locally. How far the process "paid" we do not remember. It got rid of a good deal of unwanted material very efficiently, provided heat for the works and some come-back from the products made.

Export Notes.

For the benefit of those interested in export trade we publish the following memorandum by the Board of Trade:—

It is essential in the national interest that exporters should be encouraged to maintain and increase their export trade to the greatest extent consistent with vital war needs, and the Government are anxious to assist exporters.

Some Government direction of the flow of materials for manufacture has inevitably become necessary, but this does not mean that supplies will not be available for export.

No general system of permits or priorities in the allocation of materials is in force, and for the great bulk of manufactured goods which form the normal export trade of the United Kingdom supplies of the required materials can, so far as can be foreseen, safely be relied upon for a period of the next three months at least.

Many materials are not subject to Government control at all and manufacturers should experience no special difficulties in obtaining supplies of these materials.

As regards controlled materials, there should in most cases be no difficulty in obtaining the supplies necessary for manufacture for export, and it should only be in exceptional cases that there is insufficient for export needs.

Meanwhile the Minister of Supply has issued instructions to controllers and their staffs to make every effort to allocate supplies where it appears to them that the controlled materials are for the manufacture of goods for export, especially where those exports are to be in the form of highly finished goods in which the cost of the raw materials forms a small part of the value of the goods.

Some manufactured goods cannot be exported without a licence, though there are many classes of goods not subject to this control. As regards goods subject to export licence, the issue of licences has been greatly accelerated. To meet the requirements of exporters, the issue of general licences has been increased, and these will be granted wherever practicable. In certain cases applications have been received for licences to export to neutral countries adjacent to Germany quantities of raw materials and semi-manufactured goods greatly in excess of the normal flow of trade, and it may, of course, be necessary to limit such exports.

Obituary.

Lieut.-Colonel Jenkins, director of Plastilume Products, Ltd., Station Works, High Wycombe, died on October 14 after a brief illness. His death will be deeply felt by all his many friends in the industry, particularly his co-director of Plastilume Products, Ltd. It will be remembered that Lieut.-Colonel Jenkins had been associated with the company since its inception. We in this office have many pleasant memories of talks held in his office.

Raw Materials

IN our last issue we permitted ourselves some preliminary remarks regarding the supplies of materials vital to our industry, and, certainly, as we surmised, it was not so much the lack of actual raw materials over which users grew grey before their time but the miserable kegs in which they should have arrived that were not to be had for love or money, or the cardboard and wooden containers in which finished goods are dispatched that didn't arrive in time or the transport promised weeks ago and hasn't arrived yet. What a first month or so it has been. As for moulders the situation has been rather the same, only, in addition to the above worries, it's no easy matter to get the few miserable screws or other metal parts wanted occasionally as inserts. However, we hear the situation is rapidly easing up.

Phenol-formaldehyde Resins

As we hoped, we are told that there is no danger of any shortage of phenol or of formaldehyde, although we understand that higher prices are on the way. This, within limits, is to be expected in view of war-risks insurance, A.R.P. expenditure and higher working costs.

Phenol. There is no shortage at all, we hear, of phenol and what we said about the difference between the situation to-day and in 1914 is substantially correct. The use of phenol for making picric acid for explosives is extremely small. It is apparently used for special types, but lyddite, as the explosive was called, is probably non-existent for shells. The situation might change, of course, were the supplies of T.N.T. to become scarce, so that recourse to picric acid might become necessary. This will depend solely, we should say, on the intensity of artillery fire employed on the fighting front. In this queer war let us hope that both sides don't use much. In any event, we cannot see a shortage of T.N.T. The amount of toluene available is large and can be augmented by the toluene which can be extracted from certain types of petroleum.

Important news with regard to phenol is the fact that the Monsanto Chemical Co. have begun operating their synthetic phenol plant.

Formaldehyde. Some concern is being felt in the industry with regard to this material. It is made from methyl alcohol which apparently also finds use in munitions manufacture, dyestuffs, etc. Synthetically it is made by only one concern in the country. If there is danger of shortage it is high time the industry investigated the problem of increasing production of methyl alcohol by wood-distillation which has been carried out in this country for more years than anybody remembers. We refer to the subject again in an editorial in these pages.

The remarks on formaldehyde refer, of course, also to hexamine, which is merely a derivative of formaldehyde.

Wood Flour. Although the usual quantities of wood flour from the Scandinavian countries have not arrived, resin manufacturers are not unduly perturbed. Most of them were able to lay in large stocks before war broke out, while some are confident that English suppliers will ease the situation if the trouble becomes urgent. There is little doubt that Scandinavian material, now that our dear old friends are again sinking neutral shipping, will be sold at higher prices to cover the risks.

Amino Resins

As we inferred in our last issue, there is no danger of a shortage of urea for this industry. As for other raw materials, the remarks on formaldehyde and wood flour, etc., made above, apply in exactly the same way.

Cellulose Plastics

In spite of increased demand all round, supplies are being well maintained, a goodly proportion being imported from abroad under licence. Vast quantities of the acetate sheet are being used in aeroplanes, gas mask goggle or visor manufacture. Happily, too, there is every indication that normal use of sheet and powder, used in sign-making, advertising, container manufacture and in the injection moulding industry is improving steadily. In passing, it is well to note that for some time past now Cellomold, Ltd., have been extruding cellulose acetate in the form of tube and rod of varying cross section. This may introduce new ideas to manufacturers.

With the sheet and powder industry itself some little worry has been caused through a temporary hold-up of the manufacture of phthalic anhydride by one of the two concerns in the country. We understand that the trouble has now been rectified. The importance of phthalic anhydride lies in the fact that it is the raw material for making phthalate plasticizers for cellulose acetate.

Casein Plastics

Our remarks on casein in our last issue were not too well put. It stated "It will be interesting to see how far the casein plastics industry will be allowed to exist or whether the Government will collar all supplies for food or glue purposes." Our old friend, Mr. Robert Dodd, rebukes us in his gentle way with the following letter, which we are glad to publish herewith.

Stroud.

The Editor, *Plastics.*

Dear Sir,—The article in your October issue under the heading "Our Raw Materials" suggests that the Casein Plastic Industry may not be allowed to exist in war time, and this may perhaps convey the impression that Casein plastic materials are not of great national importance.

Erinoid, Ltd., was established in this country prior to 1914 and during the last war was busily engaged on Government work for both Services.

There was then no curtailment of Casein raw material, and in view of the fact that we are again engaged on important national work, there seems no reason to anticipate that the Government will interfere with the raw material supplies of this industry.

For Erinoid, Ltd.,
ROBERT DODD,
Acting General Manager.

Luminous Plastics

As so many inquiries have been made regarding these materials, a word or two may be useful. Manufacturers, or those purporting to be able to supply, have been inundated with requests from all sorts and conditions of industries and supplies are woefully short of demand. The trouble lies in the fact that luminous pigment is not easy to make, especially in very large quantities—

some go so far as to say that the French are the only people who can do it really well—that is, to produce a pigment the luminous powers of which are more than a couple of hours. It is true that the French have done most research work on it and this country very little, but it should not be beyond our wit to do so. We understand that Messrs. Scott Bader and Co., Ltd., of London, are now manufacturing the complicated mixtures of metallic sulphides to their complete satisfaction, although not yet on a very large scale. We believe that Thomas Tyrer and Co. are also manufacturing a satisfactory material. It is claimed, however, by some that what may be satisfactory for the paint industry is not necessarily acceptable by the plastics industry. It is certainly true that one moulder has given up moulding luminous plastics, due to lack of material.

As for luminous acetate sheet, Mr. Bell, of May and Baker, Ltd., tells me he hopes to obtain supplies of this 10/1,000-in. thick in reasonable quantities soon.

The Industry in War Time

ONCE again we go round the industry to peep within and report their woes and joys. Most of those we interview say it is far too early to judge what is happening, and, of course, we agree. However, any news is welcome and we retail it as we get it.

The most important news to report is that no disastrous events have happened as in some industries. Indeed, the case is often the reverse and a quiet optimism is prevalent. Among the moulders the only trouble is often that where the industry touches the metal industry—that is, metal inserts are difficult to obtain and one must wait for new moulds with more than ordinary patience.

Fraser and Glass, Ltd.—This concern is very busy indeed and is turning out its usual peace-time jobs and some new ones. Their latest is one which they do not wish to talk about too much, but have been kind enough to send us two samples. It is obviously a portion of a speedometer or similar indicating or calculating machine, and a very ingenious application of plastics it is. An amusing sequel is that we wrote to a well-known concern saying that we had such an indicating wheel in our possession, hoping that they might be able to employ plastics in their own and somewhat related machines. The reply came that it was quite impossible to make them of plastics! Like the giraffe—there is no sich animile.

A brilliant piece of moulding by Fraser and Glass. The diameter of the wheel is about 0.7 in.

May and Baker, Ltd.—Imports of Rhodoid acetate are rolling in very satisfactorily and there are ample supplies even for the advertising and allied trades. Great interest, Mr. Bell tells us, is shown in the fluorescent material, which glows so beautifully under u.v. light. The Electric Lamp Manufacturers' Association are holding an exhibition at Savoy Hill to show its potentialities.

Ashdowns, Ltd.—This fine concern has long specialized, among other things, in the motor industry, having been among the first to mould window frames and facia panels. On the outbreak of war, with the reduced production in the motor industry, a proportion of the business thus disappeared. Happily, however, they are gradually filling its place with other work of a more or less normal character. Government work, either directly or indirectly, has increased, but not to any extent. They are definitely not concerned mainly with Government orders.

Healey Mouldings, Ltd., inform us that the works are carrying on largely on Government orders, but that normal peace-time work continues, although in uncertain manner. They are exceedingly busy on Government priority jobs, while other work is largely of the nature that replaces metal.

Souplex, Ltd.—Mr. Nevison writes: "We are pleased to advise you that we are very busy. Our orders are normal peace-time requirements, although heavier export business is responsible for a fair share of the increased output. Several inquiries have been received for articles previously made in metal, but on account of the difficulty in obtaining new moulds we have not been able to accept new orders."

Scott Bader and Co., Ltd.—This concern which normally, in peace time, imports certain raw materials of considerable interest to the plastics industry, e.g., chlorinated rubber, celluloid, cellulose-acetate sheet and plasticizers for acetate sheet and powder manufacturers, has, because of the needs of the times, begun the manufacture of luminous pigments. Full production has not yet been reached and most is apparently designed for paint manufacturers, but perhaps some will be available for plastics. This concern has had the intelligence to issue a special bulletin of raw materials available to replace those which originally were obtained from Germany.

Inlay Mouldings, Ltd.—During a visit to this Ealing concern Mr. Hallett told us that, while the company was carrying out some Government work, by far the greatest proportion was in ordinary good, healthy, peace-time jobs, such as the Miami camera for the next season, a Toby Jug for Bourgeois, and so on. So much the better. Mr. Hallett believes that the present time is one of great opportunity for the plastics

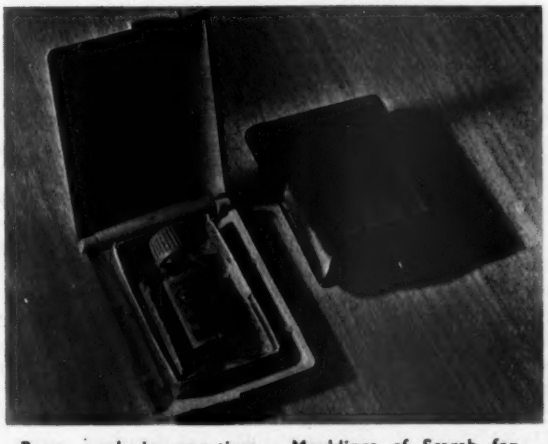
industry, especially from the point of view of replacing metals. He hopes, too, that it is also an opportunity for the elimination of ruthless price-cutting. How we echo his sentiments.

Prestware, Ltd.—This was one of the most pleasant and cheerful visits we have made since war broke out. We had always known that this company is in rather a unique position, having paid a very substantial dividend to its shareholders for a long time past. Mr. Boite claims with modesty that the presses are, and have long been, fully occupied round the clock and that the employees have always been paid considerably more than standard rate. Perhaps the latter fact is due to the former. A fair amount of Government business is being done and may eventually be from 25-30 per cent. of the total, but there is practically no countermanding of non-war orders. We got ample proof of this, for Mr. Boite took us round the factory, where enormous quantities of safety-razor cases, containers for Bourgeois scents of new and attractive designs and most striking electric-iron handles were being made. That this type of utility machine is being turned out speaks well for the health of industry generally. We left this factory considerably heartened.

Ray Mouldings, Ltd.—This concern gives us the good news that only one order was held up because of the war. Otherwise orders have been normal, including the fancy goods trade.

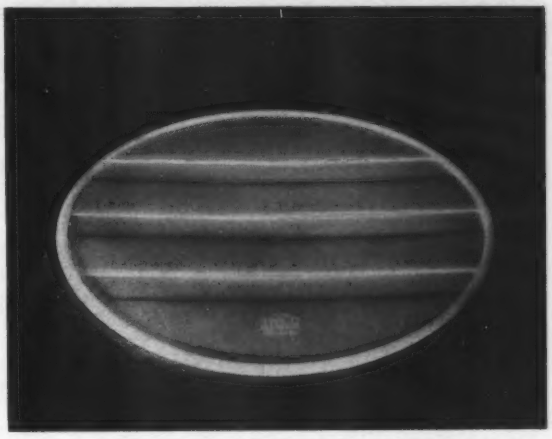
British Industrial Plastics, Ltd.—The three constituent companies of this concern, which manufacture urea-formaldehyde resin moulding powders, fabricate mouldings and produce the steel moulds and dies for their own needs and for the trade, have now completely settled down after a trying month, during which Mr. Peter Chance, Mr. Mendl and many others joined their army units. We wish them all the best of luck and safe return. In passing we note that Mr. Kenneth Chance, in addition to the heavier duties thus put on his shoulders, has consented to continue for another year his presidency of the Institution of the Plastics Industry.

There is no possibility, so far as can be ascertained, of a shortage in urea resins. So much Mr. Dingley tells us, which is good news, for on all sides we hear that the fancy goods trade in many of its branches is flourishing. This is borne out by the busy condition of Streetly Manufacturing Co., Ltd., which, although doing some Government work, has plenty to do in the way of perfume containers, cigarette boxes and novelties for the forthcoming Christmas trade. Here is a sample of a new perfume container in the form of a match-book holder, which thus becomes a re-use container after the perfume has served its purpose. They are moulded for the well-known brands of Californian Poppy and Black Tulip in black, red and cream Scarab.



Peace work in war time. Mouldings of Scarab for Californian Poppy and Black Tulip perfumes.

Another extremely successful job carried out by this company is the diffusing screen which is fitted to the new A.R.P. head-lamp mask, the use of which was made under the Lighting (Restrictions) Order of September 1, 1939. The new head-lamp mask is fitted with a light-diffusing screen, the specifications of which are as follow: It should be of white or colourless non-inflammable material, matt on one or both sides and having a transmission factor of approximately 70 per cent. The material should not exhibit any cracking, darkening, substantial deformation or other sign of deterioration after four hours' continuous use in a head lamp employing a 36-watt bulb. Trico-Folberth, Ltd., have registered the design shown in the photograph. This is now being moulded of a special Beetle urea-formaldehyde moulding powder by Streetly's in very large quantities.



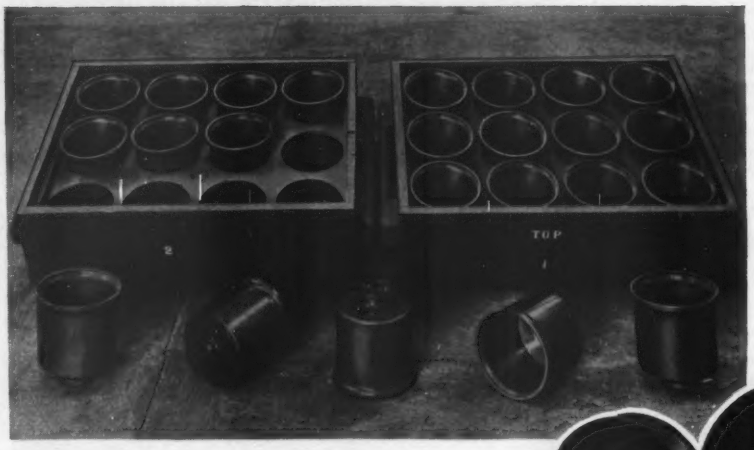
The Trico Diffusing Screen, moulded by Streetly's. It is about 40/1000 in. thick and is designed to give the requisite quantity of diffused light.

Erinoid, Ltd.—We have received cheering news from Stroud, where things are humming. They are making large quantities of khaki sheets, rods and tubes from casein, Air Force blue sheets, rods and tubes, presumably for Army and Air Force buttons, etc., black sheet, rod and tube for electrical work, identity discs in large quantities, and luminous discs for the black-out. The foregoing is all Government and allied work. As for the cellulose acetate and synthetic resin production, Erinoid, Ltd., is "head over ears," and the plant is working to full capacity.

British Xylonite Co., Ltd.—Similarly this company is working full out. We forget the astronomical number of toothbrushes they are turning out for the Forces, but they are almost unbelievable. We were also cheered by the fact that B.X. is about the only concern that can make a decent table-tennis ball, so that export business is big. This company is reaping considerable benefit from the fact that no celluloid objects are coming from Germany, Italy or Japan, and that very low-priced goods, generally due to low-paid labour, will no longer be with us, for the duration at least. It will give a considerable fillip to the British toy trade, which suffers so much from the entry of Japanese goods.

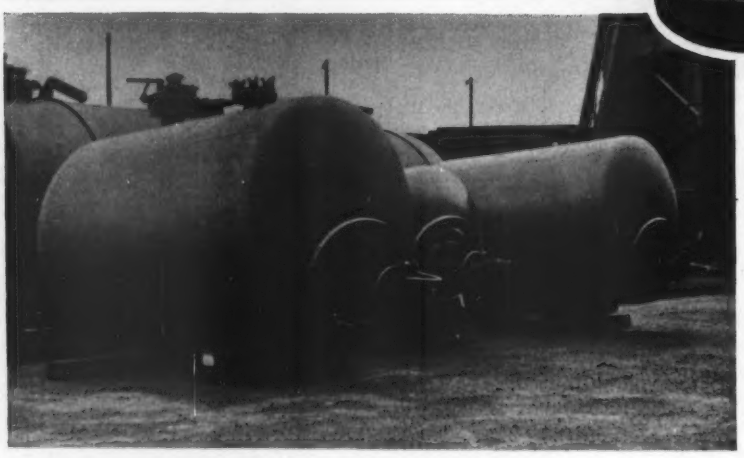
New Industrial Applications of Lithcote

Briefly summarized in this article are some of the latest applications of Lithcote protective finish in British industry



A quantity of spinning pots used in artificial silk manufacture which have been treated with Lithcote protective finish.

Dough mixing pans for bakeries, treated with Lithcote. These pans are completely immune from the corrosive effect of salt present in the dough.



Several large beer storage tanks, lined with Lithcote finish. Newton and Chambers, Ltd., inform us that a number of these tanks are in use in the brewing industry in this country.

WE have just received some very interesting notes from Newton, Chambers and Co., Ltd., Thorncliffe, Sheffield, regarding new applications of Lithcote, the well-known phenolic protective coating, in this country. In the textile industry, for instance, a large number of spinning pots used in connection with artificial silk manufacture are now being treated with the finish and apparently give every satisfaction. The high resistance of Lithcote to the corrosive effects of acids and other chemicals ensures a long life for the treated pots.

In the brewing industry a number of beer storage tanks have been Lithcote lined. The great advantage of this lining is that it will not contaminate the product and is sterile and easily cleaned. In addition, the metal coating is fully flexible and non-chipping and, moreover, the actual lining of the tank can, if necessary, be carried out in situ.

The baking industry is at the present time using Lithcote treated dough-mixing pans, and a large concern specializing in the production of bakery machinery is very enthusiastic about the protection afforded by the finish. Already these mixers are in regular use in Co-operative and other well-known bakeries throughout the country, and stand up far better to heavy wear than the ordinary tin-lined pans, which are liable to be corroded by the salt present in the dough. It is claimed that the Lithcote lining affords the maximum protection and freedom from all corrosive agents likely to be present and, in addition, it is easily cleaned. Another important advantage is that the dough does not stick so readily to the pan and, therefore, the work of the baker is considerably lightened.

In the food industry the use of Lithcote lined filter press plates is steadily increasing, and already a number are in regular use in breweries and dairies.

KOROSEAL

In this article is a description of the properties and applications of the famous American rubber-like plastic, known as Koroseal, which is, in many ways, similar to other well-known polyvinyl plastics

IN 1936 Mr. J. W. Schade, Director of Research of the B. F. Goodrich Co., announced that his company were developing commercially a new series of products consisting basically of plasticized vinyl halide. Since that time Koroseal, as the new plastic is called, has made great headway in the United States and in this country a great deal of interest has been aroused, especially as supplies of Mipolam and other vinyl chloride products of German origin are no longer available. In this connection it is satisfactory to note that supplies of Koroseal through a prominent British manufacturer, who acts for Goodrich in this country, will, it is hoped, shortly be available.

The Koroseal range includes material varying in hardness from that of hard rubber to soft jellies. The harder varieties may be lathe cut, bored and threaded and all compositions may be moulded to any shape, extruded or sheeted. All the various forms of the parent compound possess properties that adapt them for many applications where previously rubber was exclusively used. This is particularly interesting as Koroseal is generally superior to rubber in resistance to corrosive liquids, such as mineral acids, and various oils. In flexing life and resistance to sunlight and water Koroseal is a great improvement on natural rubber and in addition the plastic material possesses an unusual resistance to natural or accelerated ageing and natural or induced oxidation. It is flame-proof, odourless and tasteless.

Data supplied by Goodrich shows that Koroseal is resistant to sulphuric acid in all concentrations at room temperature; nitric acid in all concentrations at any temperature up to boiling point; hydrochloric acid over its entire range of concentrations and boiling points; alkalies in all concentrations cold or hot; plating solutions of all kinds; 30 per cent. hydrogen peroxide; saturated chlorine water; 10 per cent. sodium hypochlorite solution; saturated aqueous sulphurous acid; oleic and lauric acids.

In light and heavy oils Koroseal shrinks and stiffens slightly, all of which changes are accelerated by rise of temperature. The material is not, therefore, suitable for work which requires total immersion in petroleum or oils, organic compounds containing chlorine or nitro-groups, aliphatic or aromatic amino substances. For service where a minor portion of surface is exposed to oils, as is the case with gaskets or sealing rings, Koroseal gives very satisfactory results.

The useful temperature range of these compounds varies from approximately 13 degrees below zero to 257 degrees F. Generally, however, they are not recommended for any higher temperature than 150 degrees F. without special approval from the manufacturers.

In the August, 1939, issue of *Industrial and Engineering Chemistry* there is an account of recent developments with Koroseal by F. K. Scholnfeld, A. W. Browne, Jr., and S. L. Brous. These authors point out that Koroseal, as its name implies, is outstanding among synthetic rubber-like materials for "sealing against corrosion." The remarkable corrosion resistance of Koroseal arises from the chemical stability of gamma polyvinyl chloride, which, in turn, results from its absence of olefinic unsaturation and its high chlorine content. Early samples of Koroseal have retained their physical properties for 12 years without appreciable change. Accelerated ageing tests in the Bierer bomb and Geer oven produce practically no change in tensile strength and elongation. The flex resistance of the material is more than 10 times that of rubber, if used under conditions which do not involve heating and an abrasion resistance equal to or better than the best rubber compound.

As regards applications it is pointed out that in the electrical, wire and cable industries Koroseal is ideally suitable for many applications as insulation or sheathing. The material has high dielectric strength, complete resistance to corona cutting, good insulation resistance and capacity of being compounded to provide low power factor and dielectric constant. For such uses as insulation on apparatus and machinery wire, switchboard and station control cables for light and power service and building wire the material is finding increasing applications. It is also being used in power and control cables both as a replacement for lead sheathing and as a protective sheathing over lead. In the textile industry Koroseal has found extensive use as a roll cover owing to the fact that it possesses proper frictional drag properties for drafting yarns, resilience to cushion against pinching, toughness to resist channelling or grooving from wear, flexiblity to run in contact with fluted steel surfaces and resistance to oils and acids used in spinning, weaving or dyeing; moreover it is capable of being ground to freshen the surface so as to produce the desired finish on wool, cotton or rayon. In the chemical industry it is excellent for covering tanks for use in the pickling of stainless steel with a mixture of nitric and hydrofluoric acids. It is also used for plant handling chromic acid in chromium plating works.

Transparent, moisture-resistant, odourless Koroseal is used for waterproofing cloth. It is also used for making sail and deck covers for marine service, automobile topping awnings, hospital sheeting, tarpaulins, etc. Mechanical applications of Koroseal-coated fabrics include belts for transmission and conveyor service, diaphragms for meters and pumps, machine aprons and printing blankets. Moulded and extruded Koroseal diaphragms, expansion joints, seals and packings are widely used in the engineering industry in America and flexible gaskets of Koroseal are used in grease guns and in liquid-filled shock absorbers.

Korolac, a solution of Koroseal, was announced by the B. F. Goodrich Co. some time ago as a protective coating for plating racks used in the electrode position of metals. Korogel, a highly plasticized form of Koroseal, has been tested for over four years as a matrix material for the casting of plaster of Paris and cements.

NEW PACKS FROM AMERICA

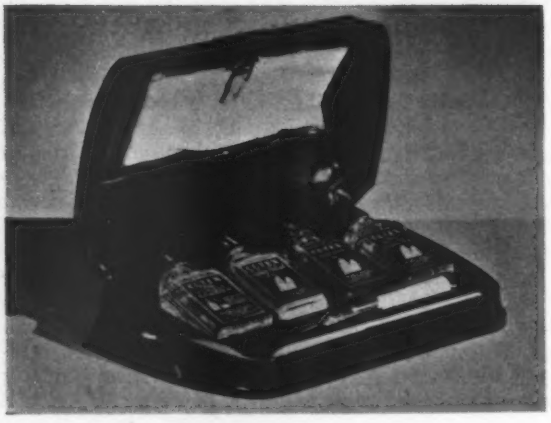
AMERICAN manufacturers are particularly adept in utilizing special packaging materials as a means of dressing up standard merchandise for gift and holiday purposes. To achieve this object good use is now being made of plastics, both thermo-setting and thermo-plastic; in some cases the moulded container serves a double purpose inasmuch as it forms a unit for counter and window displays, which helps materially to focus attention on the merchandise. An ingenious use has been made of acetate sheeting by the well-known American cosmetics firm of Caubaye Inc.

For a powder jar an attractive round, re-use box is formed of two die-pressed sections of acetate. One of these is cemented to a shallow transparent cylinder to form the box base. The other forms the slip-over cover. The cylindrical section is printed, while in the flat, in a deep burgundy design with reverse lettering backed, in the assembled package, by the product itself as seen through the jar walls.

Within the jar acetate has been called upon to provide a puff-tray, situated in the neck of the jar so that the puff is always accessible. The tray also insures that the puff may be kept free from an overload of powder. It is easily lifted to provide access to the main face-powder reservoir. For a combination offer of cold cream and face powder in small containers, an acetate cylinder with one end beaded is used to hold both containers, plus a circular, together as a unit.

(Top, left) This 35 cent test kit consists of a small plastic jar, a flat powder drum and a transparent acetate cylinder that holds the packs together as a unit. The acetate trays and boxes by Universal Stamping Co. Powder jar, Hazel-Atlas Glass Co. Cream jar, Colt's Patent Fire Arms Mfg Co. Powder box, E. N. Rowell Co., Inc.

(Centre, right) Face powder is packed in a table bowl with double shell metal cap. A bevelled, acetate, two-piece container has re-use as a dressing table box. The puff rests on an acetate tray set into the neck of the jar. The manufacturers are as stated above.

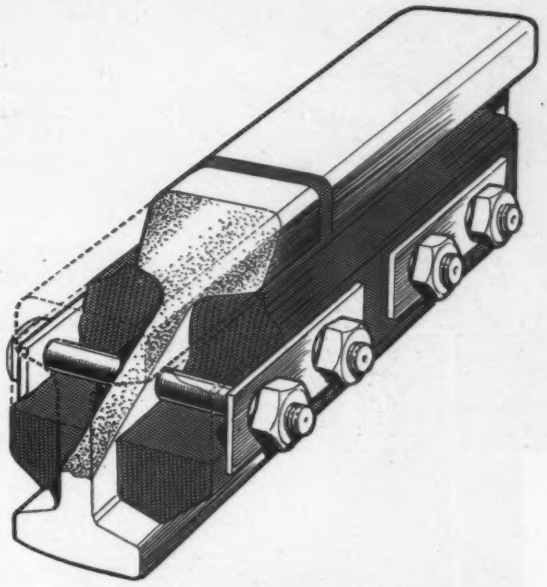


(Bottom, left) The base of this plastic container likewise holds the manicure items in individual sections. Note the metal clip which holds "Cellophane"-wrapped cotton in place. The latter is a great convenience and much appreciated by users. Durez, the well-known phenolic resin manufactured by General Plastics, Incorp., was used for moulding the attractively designed base of this outfit.

DURISOL FISH-PLATES

Interesting new use for resin-impregnated wood which is now attracting a good deal of attention among railway engineers

THE well-known electrical equipment manufacturers, The Siemens and General Electric Railway Signal Co., Ltd., East Lane, Wembley, are now producing Durisol fish-plates for electric railway tracks. Hitherto insulated joints have been built up by insulating the steel fish-plates with strips of fibre and other material and similarly insulating the bolts with bushes and washers. This method of insulation involves the use of special fish-plates, and particular care has to be exercised in fitting and maintenance. The use of Durisol fish-plates will, according to Siemens, not only simplify installation and maintenance, but ensure a more reliable service. Durisol is a compound-impregnated wood made from sheets of hardened beech wood which are treated with synthetic resin and united under enormous pressure to form a homogeneous substance of strength and hardness greater than any natural wood. The position of the fibres in the finished material influences its properties to a considerable degree and Durisol is obtainable in three different forms, all of which, however, have the same density, which is 1.4. The first quality is made up of sheets with parallel fibres and, therefore, resembles wood. This is the type used by Siemens, as it is particularly suitable for all uses requiring a great resistance to traction and flexion and is well adapted for the manufacture of pieces of great resistance for electrical work, such as insulating fish-plates for railway tracks, as well as accessories for textiles, various kinds of flooring, gear wheels, etc. The second quality consists of impregnated layers assembled by crossing the fibres at 90 degrees and is recommended for applications requiring a greater resistance to compression and shearing than the first grade. The third quality consists of successive layers placed with their fibres crossing at 45 degrees, so that the resistance is practically the same in all directions. This is the very best material for the manufacturers of rollers and noiseless gearing of many different kinds.



Close-up of the Durisol fish-plates which provide a very high degree of insulation and possess a long and trouble-free life.

A NEW PLASTIC PIPE

ONE of the most famous pipe makers in the United States, Bachmann Bros. Inc., of Philadelphia, after careful experimental work with Du Pont plastic moulding powders and mass-production methods, is now manufacturing excellent pipes in many colours and at a price that is acceptable to smokers. These pipes, on which patents are pending, are being sold under the trade-mark "Varsity."

They are the first to combine the smoking pleasure of a briar with the eye-filling satisfaction of colour. The bowls of Plastacele cellulose-acetate composition incorporate a genuine briar insert, so designed that parallel horizontal fins on the outside of the insert engage with vertical ribs on the inside of the plastic housing, thus providing "air insulation" to keep the pipe cool. The stems of moulded Lucite methyl-methacrylate resin are capable of withstanding the abrasive action and pressure of the teeth. The material does not expand or contract under normal pipe temperature and moisture conditions and, at the same time, retains its gloss over a long period. Each pipe, too, contains a standard metal filter, which can be withdrawn easily for a complete cleaning.

These composite pipes are available in a very wide range of colours, both stems and bowls. Apart, however, from colour, the smoking quality of the pipe is said to be excellent.

While colour is the outstanding feature of Varsity pipes—and they have already been moulded in the colours of 42 leading colleges and the two World's Fairs—other advantages recommend them. These pipes are light in weight, rest comfortably in the mouth and are practically unbreakable. Moreover, a flat spot on the bottom of each bowl helps to solve the "parking" problem. Retail distribution is being made through leading drug stores, campus shops and tobacco stores, and it is reported that there is a very healthy demand. The only point we are doubtful about is the ability of the acetate bowl to resist warping and swelling by the action of heat, but we are assured that the air insulation provided is sufficient to keep the bowl reasonably cool and free from distortion. There is no doubt that the design has been very cleverly thought out and we certainly think that great credit is due to both Bachmann Bros. and Du Pont.

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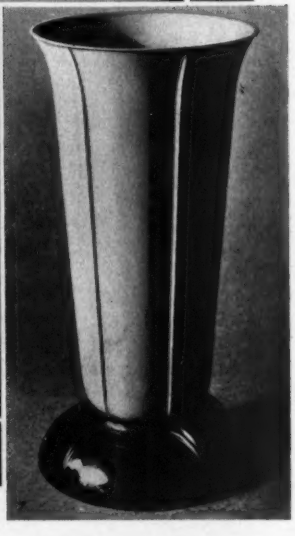
NEW DEVELOPMENTS FROM BOTH SIDES OF THE ATLANTIC



(1) This new "Magic Hanger" is moulded of colourful cellulose acetate, manufactured by Monsanto Plastics, U.S.A.

(2) This luxurious cocktail and hors d'œuvre accessory is manufactured of Marblette, the well-known cast resin produced by the Marblette Corporation, and fabricated by Harris-Dun Corp., 1 E. 33rd Street, New York, N.Y., and appropriately named "Wonder Bar."

(3) The neat design and easy-to-grip surface should make this new jar cap of considerable interest to confectionery manufacturers. It is moulded of green Scarab by The Streetly Mfg. Co., Ltd.

(4) Sparkling Monsanto plastics have played a part in creating a new and daintier method of applying dusting powder. Developed by Faberge of New York. Handle is of cast phenolic resin and the brush case and refill of Monsanto Vue-Pak plastic.

(5) Ample protection against dust, rain and air resistance is provided by the "Bronco" Bike Shield, made by the International Mfg. Co. of Boston, from Monsanto Cellulose Nitrate.

(6 and 7) A shortage of cheap glass vases has encouraged The Streetly Mfg. Co., Ltd., to mould this flower vase in coloured Scarab. The vase is in two parts; the top portion, which is available in several colours, fits securely into the black base.

A New Anti-percussion Latex Film

Described in detail is a practical and economical method of protecting windows against the shattering effect of blast from high-explosive bombs

SINCE the publication of Mr. P. Mabb's article on "Anti-percussion Latex Films," in the August issue of this journal, we have had an opportunity to examine some additional anti-shatter preparations, particularly an improved latex compound made by Mason Products, Ltd., Northolt, Middlesex. This new preparation contains a very high content of dry rubber and is specially compounded so as to resist the deteriorating effects of heat, light and oxygen. Normally, the life of the rubber varies according to the temperature and climatic conditions of exposure, but it has a minimum life of four months and a maximum of nine months. A very important improvement initiated by Mason Products, Ltd., is the use of a matt finished sealer or binder which protects the latex film and increases its life up to two years.

This new anti-percussion latex is naturally more expensive than straight latex preparations, but its greatly increased life, high adhesion to all surfaces and maximum resistance to deterioration are factors which must be taken into consideration. The Mason Product is very economical and one gallon is sufficient for 40 square yards. The tensile strength of the film is 3,500 lb. per sq. in. and its elongation point 800 per cent.

Unusually severe practical tests carried out independently have clearly demonstrated the ability of the film to give maximum protection when used as an anti-percussion dressing for factory and other windows.

Spraying or brushing can be used, but the former is particularly recommended. Dr. H. J. Stern, who is responsible for the technical development of Protec, the proprietary name of this latex, recommends that all spraying equipment which comes into actual contact with the latex should be tinned and celluloid pressure cups or ordinary cups used in place of metal ones. It is most important that the latex should not come in direct contact with copper, which promotes the rapid oxidation of the latex by catalytic action. The Mayfair Spraying and Decorating Co., Ltd., who use large quantities of Protec, take the most elaborate precautions to see that the compound is kept free from all metallic contamination during its application.

It is interesting to record that Mason Products, Ltd., commenced business by spraying medicine bottles and cosmetic containers with tinted latex, but on the advent

On the left is a latex-protected window at which several bricks have been thrown. Note the way the glass splinters adhere tenaciously to the latex film which not only covers the glass but is anchored securely to the frame. Picture on right shows how easy it is to remove the film from glass.

of war this business naturally slumped very badly. Immediately an opportunity arose for anti-percussion preparations for treating factory windows. Protec was made available in bulk for large industrial concerns and not only was the clear latex sold for protective purposes, but also coloured latex, particularly dark blue. The dyes and pigments employed for coloured latex are very fast and on test have shown themselves unaffected by ultra-violet light for long periods. The black, made by compounding the latex with pure carbon black, is particularly good and absolutely impenetrable to even strong sunlight. Blue Protec has been very extensively used, as it enables a certain amount of light to filter through in daytime and yet blacks out interior lighting at night. It is recommended by the authorities when used in conjunction with tinted lights, and here, again, Protec is utilized for colouring the electric lamps.

Another very interesting and important application of this new latex compound is for camouflaging industrial and other types of buildings. These have to be broken up to look like rows of houses or part of the countryside. The flat colour of the latex is very necessary, as glossy paint reflects light and so betrays the presence of a treated building. Mock shadows have also to be painted on both ground and roofs, as they confuse the airman who is on the look-out for natural shadow effects thrown by big modern factories.

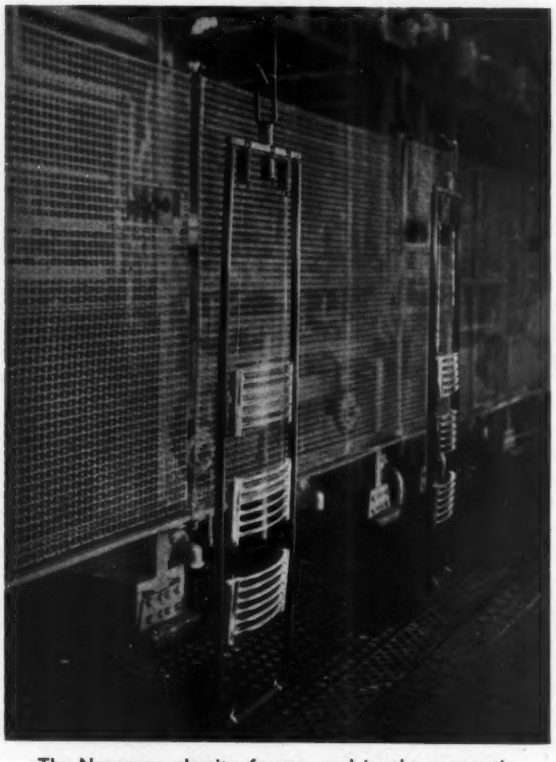
Practical tests have demonstrated the ease with which the film can be removed from glass and other surfaces should this be necessary. No solvents or chemical removers are necessary, and all that is required is to pull the film of rubber away from the treated surface. The great ease of removal is well demonstrated by the photograph on the opposite page.

NEOPRENE EBONITE FINDS NEW INDUSTRIAL APPLICATION

THE advent of automatic plating plant has increased the need for an insulating material that will withstand hot alkali and acid solutions and present a smooth, free-rinsing surface. The latter feature is necessary to avoid the carrying over of the different solutions from one tank to another. For the plating of small articles which have to be wired into frames, a method of construction has been evolved that completely eliminates the problem of metal being deposited on the frame. This is built up of extruded flexible ebonite tubing of $\frac{3}{8}$ in. external diameter and 5/64 in. internal. A $\frac{1}{8}$-in. brass rod is pushed into the required length of tube and the right-angle bends are produced during immersion in hot water, which enables the whole assembly to be bent quite readily. The upper horizontal bar from which contact is made is then brazed or soldered on to the brass rod. Soft soldering can be carried out without risk of burning the ebonite if a clearance of about $\frac{1}{2}$ in. is left between the top of the latter and the horizontal bar. As the plating solutions only reach to within 3 ins. of the top of the ebonite tube, they cannot find an entry, so that no sealing composition is required at the open end. Springs may be permanently attached to the upper bar to maintain the tension of the wires in connecting up the work.

Previous to the use of flexible neoprene ebonite, ordinary ebonite was used in the construction of these frames. The brittle nature of the ebonite limited their life to a matter of weeks, fracture occurring particularly at the right-angle bend. Flexible ebonite, on the other hand, has such great shock resistance that frames made of this material show no fracture or deterioration after two years' service. Moreover, the resistance of the neoprene flexible ebonite to plating chemicals is found to be superior to that of ordinary ebonite.

Flexible, shock-proof ebonite, made possible by the use of neoprene as an ingredient of the compound, has many valuable industrial applications, of which the one described above is a typical example. There is no doubt that, when properly applied, flexible ebonite can save manufacturers time, material and money, and their attention to the advantages claimed for neoprene ebonite is recommended.

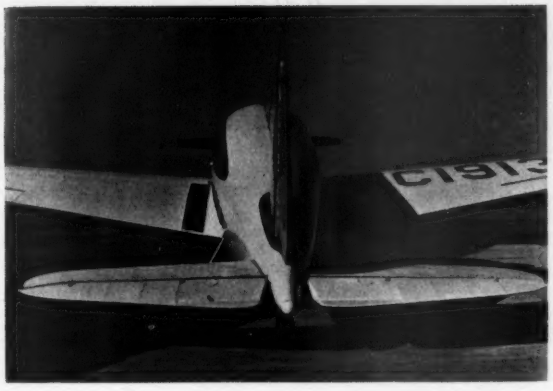


The Neoprene ebonite frames used in the automatic plating works of Wilmot Breeden Ltd.

Latex for Colouring Sandbags.

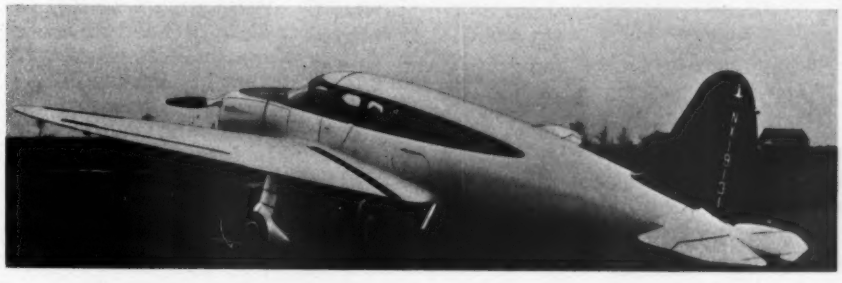
In an attempt to brighten up the rather grim appearance of sandbags, some shopkeepers and industrial concerns are having their sandbags sprayed with a green rubber solution which gives them the appearance of grass mounds. This method has the advantage of protecting as well as improving the appearance of the sandbags. Another recommendation, which is acted on by an increasing number of interested parties, is to spray the sandbags with a 15 per cent. solution of copper naphthenate in white spirit. This acts as a waterproofing agent and also as an important fungicide, preventing the jute fibres from rotting and the bags from shedding their contents.

PLASTICS IN AMERICAN AIRCRAFT



Left is a view of the completed "Clark F-46A" made by the Clark Aircraft Corporation. This is a purely experimental aeroplane which departs in several important ways from accepted aeronautical design. The photograph gives some idea of the perfectly smooth streamlined appearance, free from all rivets and other protrusions, of this interesting craft, the entire fuselage of which is moulded.

Centre is a full-length view of the machine, showing the moulded fuselage to the best advantage. The latter is moulded in two sections from "Duramold," which consists of hardwood veneer impregnated and bonded with Bakelite phenolic resinoid. Future plans call for the moulding of wings and fixed tail surfaces from the same material.



MUCH has been written about the actual use and future prospects of plastics in aircraft in the United States of America, but when one seeks the true facts in this regard it is found that the actual uses which have reached a production scale are, in general, much the same or parallel to similar uses in British and other European aircraft in so far as details in this regard can be learned at all. There are, of course, what may be termed conventional uses which include:—

(1) Windows, cowlings and windscreens, enclosures for cockpits and radio loops, gun turrets and the like, which are formed from transparent plastics primarily because these are lighter and less fragile than glass would be.

(2) Fairleads, pulleys for control cables, gears, bushing and bearings (the latter for landing gears) in which either laminated or moulded phenolic plastics meet requirements.

(3) Panels and housing for instruments, window frames and interior panels—some laminated and some moulded—which are either phenolic or urea or both.

(4) Portions of propellers, including wood impregnated with phenolic resins, and cellulose acetate coverings.

(5) Handles, knobs, escutcheons and parts of lighting fixtures which are moulded, in general, from either thermoplastic or thermosetting materials and usually embody some decorative features.

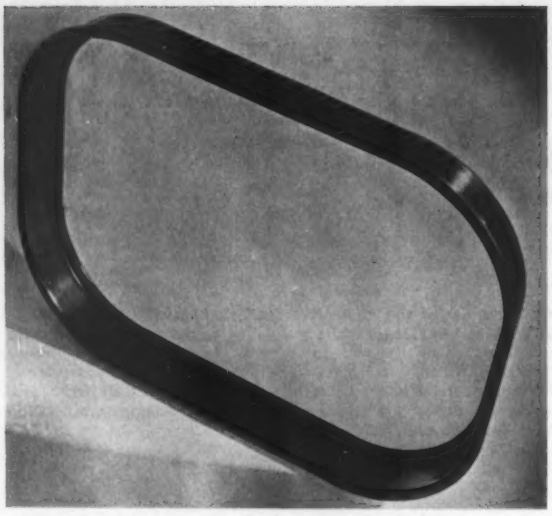
(6) Strictly dielectric parts for ignition systems, radio, lighting and starting purposes, including distributor and coil parts, accumulator cases and the like.

(7) Parts made from synthetic rubber or rubber-like materials, including gaskets and seals, possibly tank linings, and other parts which, if fabricated from natural rubber, might be subject to deterioration from contacts with oil or fuel or by other means.

(8) Parts made from natural rubber, including tyres and tubes and parts for absorbing shocks and/or vibration, among the latter being sponge-like materials for seat cushions and back rests.

Besides these conventional applications, much is being done in an experimental way with large structural parts which include virtually complete fuselages and may be extended to wings and control surfaces. Some work is also being done with pontoons for seaplanes, but there is still some question as to the practicability of any of these large structures, although some of them have been incorporated into craft which have made successful flights and give promise of future developments which may bring about the extensive use of certain forms of plastics in the not distant future. For military and patent reasons, among others, much information is being withheld and that which is available is far from complete.

Windows, cowlings and other items under the first heading above are made either from cellulose acetate



This garnish moulding or window frame is moulded by H. Paulis, Inc., from a mottled phenolic Bakelite for use in Lockheed aircraft.

or from acrylic resins, as a rule. The former is considerably lower in cost, but is understood to be somewhat more affected by weather and moisture than the acrylic materials. These have high clarity, are quite hard and are reported to have superior dimensional stability, absorbing very little water and affected but little by weathering. Tests have also been made with cellulose aceto-butyrate and cellulose aceto-propionate plastics, but particulars as to their commercial use in aircraft (if this has been attained) are lacking.

Little need be said as to items under the second heading, as these have been used for many years. They are lighter than metal parts and have smooth surfaces which are resistant to abrasion and do not abrade metal cable or other metal parts which rub against them, little or no lubricant being required.

Under the third heading, laminated plastic panels are light and fairly shock resistant and have good dielectric qualities. No applied finish is required, as a rule, and a variety of colours can be had, especially in the ureas. Moulded instrument housings also are light and, if made with macerated fabric filler, are resistant to shock.

Propeller applications (fourth heading) parallel or duplicate the German Schwartz propeller, also produced in England, and are made in the United States by the Engineering Research Corp. The basic material is wood, but root portions are impregnated with phenolic resin and cured under heavy pressure and are spliced to lighter spruce laminations at scarfed joints. The leading-edge metal is soldered to a wire mesh nailed to the wood, which is finally covered with cellulose acetate sheeting. Eight-foot propellers with a 300 h.p. rating weigh about two-thirds as much as an equivalent metal propeller.

Handles, knobs, escutcheons and the like (fifth heading) are moulded either by compression or injection (the latter for thermoplastics), much as for motorcar use. Lenses for interior lights can be moulded from translucent white or ivory urea powders which are light in weight, less fragile than glass and diffuse light, besides being affected little, if at all, by heat from the light source.

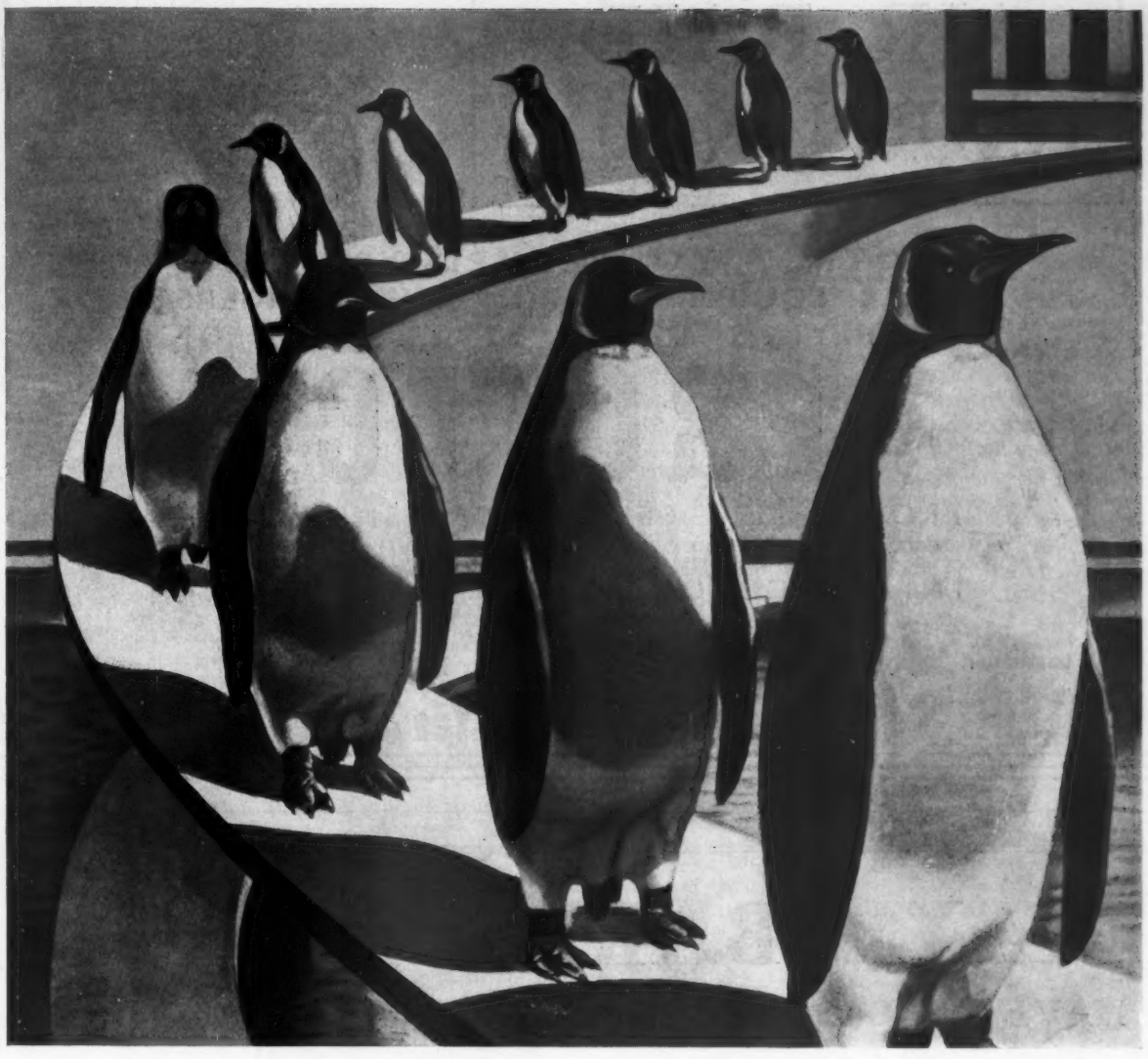
Dielectric parts (sixth heading) require little comment, being too well known. Special grades of phenolic plastic having adequate arc resistance and high dielectric properties are used. Accumulator cases of hard moulded rubber are low in cost, light in weight, resistant to acid and adequate for some applications, if not all, although other plastic might be used if a higher cost is warranted.

Synthetic rubbers (seventh heading) such as Neoprene and Thiokol are employed chiefly where their resistance to chemical attack is a factor, but are also suitable for dielectric uses where rubber might crack or deteriorate because of corona effect. These plastics can be moulded and extruded, much like rubber. Although vinyl plastics of the order of Koroseal may or may not be used in aircraft, they may well be suited for certain uses where rubber would be attacked, notably for wire insulation. The material does not support combustion and is resistant to oil and is understood to be lighter than rubber, highly resistant to moisture and high in dielectric strength.

The use of natural rubber (eighth heading) is too well known to need discussion here. It may be said, however, that the so-called "air-foam" types, which are exceedingly light in weight (being filled with minute air cells) are reported to make excellent seat upholstery and to be suited also for mattresses in 'planes for overnight travel. Extensive use for aircraft seat upholstery is reported.

Although progress with aircraft in which large structural members involving the use of what are termed

Exterior view of the fuselage of the Clark aeroplane. The shell is moulded in two halves. The pieces cut out of the fuselage to form openings for doors and windows are utilized to close the openings. The size of the complete moulding can be judged by that of the men.



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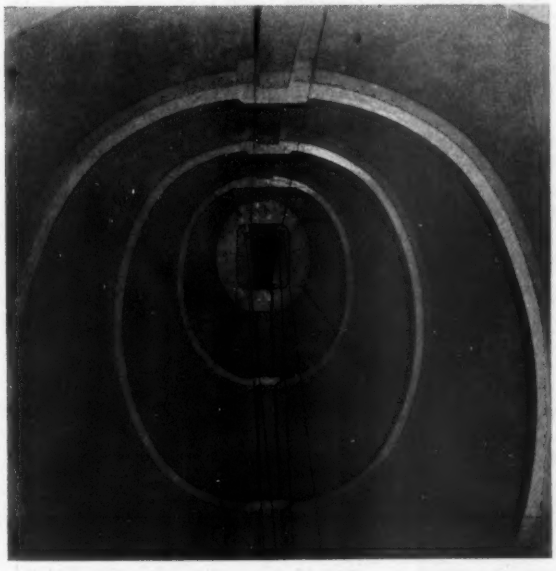
"plastics" is reported from various quarters, a material called "Duramold" is the only one on which much information is available, and even such data as have been given out regarding it are far from complete. It is generally understood, however, that this material is built up from thin veneers of selected wood which have been impregnated with phenolic resin and are then fabricated by a moulding process into parts as large as one-half of a fuselage. The nature of the moulding process remains unrevealed, but it is understood to involve much lower pressures than are required in moulding the common phenolic materials.

Development of Duramold is credited to joint investigation of the Haskelite Corp. and the Bakelite Corp., the former a manufacturer of plywood products. Mouldings made to date have been made chiefly, if not entirely, as far as the public has been informed, by the Clark Aircraft Corp., which has built and flown at least one aeroplane in which the entire fuselage is a moulded structure fabricated from two mouldings, each representing half of the complete fuselage and believed to constitute the largest mouldings of plastic material ever produced. The fuselage is, roughly, conical in shape, appears to measure 6 ft. or more in diameter at the large end and about four times this in length. The shell, which includes transverse ribs (presumably moulded integrally), is said to be about 5/32 in. thick and requires no internal bracing. As no rivets or other protrusions are found on the exterior surface, which is perfectly smooth, there is said to be a marked reduction in drag as compared with an aeroplane having a metal shell.

According to data contained in a paper presented recently before the Society of Automotive Engineers by Col. V. E. Clark, of the Clark Aircraft Corp., a Duramold cylinder, weighing the same as one of Duralumin suitably reinforced, will support a compressive load some 14 times as great. This is largely because the Duramold cylinder, being much thicker, does not buckle so readily as do thin Duralumin sheets. It is pointed out that, to attain required degrees of rigidity and still be sufficiently light in weight, metal aeroplane structures require many stiffening elements for the thin sheeting required. This necessitates the application of thousands of rivets and requires much time and labour, with correspondingly high costs and slow production. Even then the projecting rivet heads and the tendency of the thin sheets to assume a wrinkled or undulating surface when under load in flight results in greatly increased drag, which, it is claimed, would be absent in a Duramold structure because the thicker section is inherently much stiffer and smoother. It is claimed that an aeroplane having fuselage, wings and fixed-tail surfaces formed from Duramold will require some 25 per cent. less power at a given high speed than the corresponding aeroplane of conventional metal construction.



Interior view of the Clark fuselage. The ribs are understood to be integral and are chiefly for support of control fittings. Joints between the two halves can be seen at top and bottom.

To date, apparently only fuselages have been constructed from Duramold, but it is said to be entirely feasible for the construction of wings and fixed tail surfaces, but not for landing gears. A strong argument favouring its use is relatively rapid construction with a minimum of skilled labour, thereby avoiding the "bottleneck," which militates against rapid manufacture of the all-metal 'plane. Reports of arrangements for large-scale production of Duramold 'planes, presumably chiefly for training purposes, have been in circulation, but according to such information as is available as this is written, consummation of such arrangements has still to be made.

An abstract of information given in the Clark paper referred to above follows: Thin veneers used in producing Duramold can be insured as to uniformity by proper inspection. Specific gravity falls within the range of 0.5 to 0.9 and can be controlled within 3 per cent., plus or minus. In moulded form the material is sufficiently non-hygroscopic and free from attack by moulds or fungi to meet requirements of aircraft service. Less than 1 per cent. moisture absorption has resulted in specimens submerged in water for seven weeks and there was no change in physical characteristics, no deformation and only negligible change in dimensions. In fatigue resistance, based on allowable stress for equal weight per unit area, Duramold is about 50 per cent. better than 17ST Duralumin. No creep occurs. The material does not support combustion, is not subject to corrosion and has excellent energy-absorbing characteristics, the damping of vibration being about five times better than metal. No sign of weakening resulted from tests of samples soaked in water for two hours at 140 degrees F. and then immediately put into atmospheres of minus 70 degrees F., this cycle of changing temperatures being repeated. High heat-insulating qualities and smoothness indicate less likelihood of icing in flight than with metal. Non-structural parts which do not require a multiplicity of riveted reinforcements can be stamped out rapidly.* There is practically no change in moisture content during moulding.

TABLE I.

Approximate values in lb. per sq. in. divided by (1,000 x sp. gravity).

Type of Duramold.	Direction of Applied Load.	Tension.	Compression.	Young's Modulus T. & C.
I	Optimum	25.75	13.95	3,060
I	90 deg. to Opt. ...	4.72	7.70	714
II	Optimum	22.73	13.03	2,730
II	90 deg. to Opt. ...	7.75	8.60	1,053
III	Optimum	19.69	12.08	2,380
III	90 deg. to Opt. ...	10.80	9.51	1,395
IV	Optimum	16.75	11.22	2,040
IV	90 deg. to Opt. ...	13.87	10.40	1,732

Shear (optimum) 10.4.

*This apparently refers to cutting the impregnated veneer so as to fit into the mould when the latter is being changed.

WORLD'S INDUSTRIES

CHEMICAL

Rubber in chemical engineering is discussed in a recent booklet bearing this title, published by the British Rubber Publicity Association, 19, Fenchurch Street, E.C.3. The booklet deals with the properties and chemical resistance of rubber, rubber linings for tanks and similar equipment, and rubber paints and cements. **Rubber-lined tanks,** cylinders and pipes are now extensively used in chemical works. In this connection it is of interest to note that a new chlorinated rubber product, in the form of a soft flexible black sheeting 0.01-0.04-in. thickness, has now been made available to industry for coating purposes by Detel Products, Ltd., Greenford, London. The product also has many other uses, of which one example is a backing for upholstery in cinemas, theatres, motorcars, railway carriages, steamships and aeroplanes. According to *The Rubber Age* for October, 1939, Detel can withstand temperatures up to about 150 degrees F., and is resistant to almost all known acids, inorganic and organic, strong or dilute, such as, for example, sulphuric, hydrochloric, nitric, mixed acid, acetic, chromic and even hydrofluoric, and to carbon dioxide, sulphur dioxide and atmospheric corrosion, as well as all organic acids, including formic and acetic. Similarly it is resistant to every known alkali in concentrated or dilute solution, such as caustic soda, caustic potash, ammonia and ammonium salts and to very many other corrosive and reactive substances, such as seawater, oxygen, ozone, chlorine, bromine, iodine, potassium cyanide, petroleum and tar fractions, alcohol and methylated spirits. The new sheeting constitutes a revolution in the lining of metal, wood and concrete tanks and much other apparatus for protection against acids, alkalis, and other corrosive products. All that is necessary is to cover the surface with the sheeting, which can be stuck together in the easiest and simplest manner merely by painting a little special solvent cement at the edges, or other part, forming a completely homogeneous coating, resembling the welding of metals. The sheets can, of course, be cut up with scissors to desired size and shape and attached by the cement in a few minutes, whilst the method is equally valuable for protecting the outside of pipes, flanges and valves and also the edges of tanks, having the area painted with Detel in the ordinary way. The sheeting, unlike any form of paint, is completely impervious because in the preparation it is run between heavy rollers and therefore no pinholes are present. Also it is flexible and shock-resistant, like rubber, so that, for example, impressions or dents resulting from blows quickly disappear. In addition, chlorinated rubber is an almost incombustible product, because of the chlorine content, and therefore fireproof, when in direct contact with a flame merely charring locally and swelling. **German synthetic plastics,** including Buna rubber, necessitates the use of a large percentage of the country's available electric current. According to a consular report in the Mineral Trade Notes of the United States Bureau of Mines, the 11,000-million k Wh consumed by the electrochemical and electrometallurgical industries of Germany in 1937 was greatly exceeded in 1938 and the demand has since been further increased, but even six months ago "the supply of electric power had not been able to keep pace and developments had been retarded." Virtually all the water-power resources of Germany proper were already fully utilized and reliance was then placed on development and transmission of hydroelectric power from Austria. The possible maximum output of the latter country is estimated at 25,000-million k Wh per annum, but, even under peace conditions, several years would have been required to reach this figure. Meantime, the total production of greater Germany for 1938 is estimated at from 61,000 to 63,000-million k Wh, and of this 3,000-million k Wh was required for the manufacture of calcium carbide alone, as the basis of various synthetic materials. The most extravagant of the latter in power consumption appears to be Buna synthetic rubber for which a figure of 40,000 k Wh per ton is given, constituting a primary factor in the high cost of this material and probably a restriction on the scale of its production.

TEXTILES

Impregnated fabric to be used as an insole for footwear can be made by impregnating a basic material of felt, thick fabric, air-permeable paper, etc., with a solution of a synthetic resin. B.P. 508,824 describes a process of accomplishing same, using polyvinyl acetate. A small quantity of nitrocellulose may be admixed with the impregnating solution, also softening-agents, e.g., tricresyl phosphate, or fillers, e.g., chalk. The impregnated insole may be provided with a lip, by skiving the edge, or a separate lip may be attached by adhesive or by sewing. **Nylon fibres** have been tested out and compare very favourably with natural wool. According to an authoritative article published in *The Times* Trade and Engineering Number, October, 1939, by Mr. B. H. Wilsdon, Director of the Wool Industries Research Association, the tensile strength of nylon in the dry condition is 51 kg. per sq. mm. and wool is 21.6. In the wet condition nylon registers 48, against 16.6 for wool. The maximum stretch for nylon dry is 60, and 74 for wool. In the wet condition nylon has a maximum stretch of 80, against 57 for wool. The modulus of elasticity for nylon is 505 kg. per sq. mm., against 260-400 for wool. Mr. Wilsdon points out that nylon, both wet and dry, has remarkably good elastic properties, but unless its moisture absorption can be improved without loss of other favourable properties it must prove a cold fibre.

GENERAL ENGINEERING

Tube floodgates have, as stated in the Press, been provided on the London Underground to protect the line against the risk of flooding after air raids. Electrically operated steel floodgates have been installed at Waterloo and other stations and special rubber-lined sealing blocks have been made to fill gaps in the gate through which the rails pass. The rubber is resistant to oil. **Conveyor belts** for oil-treated coal give a considerable amount of trouble owing to the softening and slipping action of the oil. Some interesting data on this problem and the best method of solving it is given in Number 7 of *Neoprene News*. As an example, we will consider the case of a gas and electric company using a rubber-covered belt with a capacity of 100 tons per hour, carrying ⅛-in. slack 230 ft. up a 12-degree rise. Almost as soon as the plant was changed over to oil-treated coal, trouble was encountered. The belt softened, failed to keep to the track, slipped, stretched

TRADE EMPLOYS PLASTICS

and needed tightening at regular intervals. Further, the coal easily abraided the oil-softened rubber. Finally, after 5 months' service, the belt cover had swelled to such an extent that the belt buckled and shed the coal. Only 7 quarts of oil were sprayed on to each long ton of coal, yet the rubber conveyor belt cover absorbed so much of this oil that after 5 months' use, oil could be squeezed out of the rubber. In an attempt to overcome these conveying difficulties, and thus secure full benefit from the new type of fuel, a neoprene-covered conveyor belt was installed as an experiment. The results more than justified the confidence shown in the new belt. It did not soften or slip, and showed no stretch or buckling. At the time when this report was received, the neoprene belt had been in service for over a year, and was still operating efficiently. The oil had not softened the neoprene cover, which had successfully withstood the abrasion from the coal. The way a neoprene belt cover retains its abrasion resistance when subjected to oil is emphasized to an even greater degree by observations made at a point in the plant where the coal is automatically weighed for delivery to the boilers. In the weighing system, coal is delivered from a hopper on to one end of a neoprene-covered conveyor belt. This 7-ft. belt then carries the coal to an automatic scale, which stops the delivery after each 300 lb. weight has been received. Because of the heat at this point (the hopper is adjacent to the boilers), this conveyor belt had a neoprene cover before the change-over to oil-treated coal. There is, however, another factor contributing to the destruction of these belts; they are subjected to very severe abrasions. In the first place, the hopper delivering coal to the belt holds 7 tons, and the pressure of this coal drags on the belt at every rotation. In the second place, coal gets between the pulleys and the belt, and is ground against its inner surface. In spite of this severe abrasion, the neoprene belt gave satisfactory service for a year before the plant changed over to oil-treated coal, and for a further year it had continued to resist the effects of abrasion in spite of the possible deterioration introduced by the oil. The belt was still in good condition when this report was received, and will probably give several more years' service. This new application of neoprene illustrates the amazing versatility of this synthetic rubber, which is regularly finding important new applications in industry.

ELECTRICAL

Coating wire and cable by a new process is described by Bakelite, Ltd., in B.P. No. 507,768. The method comprises immersing the articles successively in a mass of heat-hardenable coating material in liquid form and then, without intermediate exposure, in a mass of a heating liquid immiscible with the coating material. Specified heat-hardenable coating materials are phenol-aldehyde resins and polyhydric alcohol-polybasic acid resins, especially when in the early stages of formation. Such substances may be used in the liquid or fused condition and a small amount of solvent may be present, if necessary. Specified heating liquids are molten alloys, molten wax, oils and other inert relatively non-volatile organic liquids or melted solids. The function of the heating liquid is to promote hardening of the coating material.

MISCELLANEOUS

Nylon fishing lines have been tested out in the Gulf Stream off Florida with conspicuous success. Dr. E. H. Killheffer, of Du Pont de Nemours, tried out regular braided lines of 24-lb. and 36-lb. test respectively, corresponding to similar lines of linen, except that in the case of the nylon lines the diameter and weight of the line was less than a linen line of the same strength. These lines proved highly successful in practice and give promise of important applications in the piscatorial arts. **Pyroxylin-impregnated fabric** that is washable, waterproof and vermin-proof is now being used for the covers of children's books. At Du Pont's exhibit at the New York World Fair there is a machine kept constantly busy stamping out titles and decorations on this colourful fabric. **Cellulose sponges** are finding increasing applications, and a recent one is the issue of small cellular sponges with tins or jars of shoe polishes and dressings. Tests show that this man-made sponge will not crumble in the hand and will not leave streaks or fuzz on the shoes. **Rubber-coated upholstery fabric** is in good demand nowadays owing to the shortage of leather. Great improvements in production have made possible a material able to withstand considerable abrasion. When tested on a Wyzenbeek Wear-test Meter a representative sample of Cavalon stood the constant rubbing of a piece of rough duck under a load of 3½ lb. and a tension of six. Although specifications called for its showing no signs of wear after 10,000 rubs, actually it took a count of 100,000 without obvious wear. Most upholstery materials begin to wear along folded edges, and rubber, in particular, will crack under tension when folded. Yet this improved rubber-coated fabric was hung over a round bar, a quarter of an inch in diameter, with weights equivalent to 1 lb. per inch of width attached to each end of the strip, and exposed to the elements for 30 days without evidence of weakness. The constant flexing of a seat cushion when in use also produces a strain on its covering. The resistance of this particular rubber-coated fabric to such strain was tested by folding and flexing a strip to alternately form and remove a kink. After 75,000 flexes at the rate of 250 per minute, the rubber film was still in good shape. **Plastics for A.R.P.** is discussed by a correspondent in the *Electrician*, October 13. Reduction in ordinary lighting has resulted in an enormous demand for electric torches. Many of these have cases which are made of metal, but there are hundreds of thousands, if not millions, which have moulded plastic cases. Usually these are moulded from phenol-formaldehyde moulding material, but sometimes urea-formaldehyde materials are used. Moulded torch cases are lighter in weight than the metal ones, although they generally have thicker walls. They are warm to the touch, which is an advantage if one has to get out of bed and use a torch to find the way to a shelter in the basement. Phenolic materials are also finding an outlet in shades for lights. Many of these are produced in black material, but others are moulded in colours. The colours are opaque, but can be arranged so as to tone with the general surroundings in the daytime. The moulded shades possess the advantage over glass or porcelain that they are less liable to shatter if subjected to shock. **Gaco synthetic rubber,** made by George Angus and Co., Ltd., Newcastle-upon-Tyne, is now finding many important applications in industry where a high resistance to the solvent action of mineral and animal oils, etc., is urgently required. In our December issue we intend to give a full account of the properties of this new all-British product, together with some of its latest applications.

"Shelf Appeal" Awards for 1939

Plastic Containers

THE report of the judges of this important British competition is somewhat discouraging. It is pointed out that the general level of the entries this year was below the average. The trouble appears to be that, whereas the standard of British packaging has risen steadily during the past five years, 1939 has been a period of marking time. Entries for the best plastic container were astonishingly poor. Whether this indicates any serious slowing down in the general development is not, state the judges, entirely clear at the moment.

The judges comment that two plastic containers proved interesting exceptions. The first, a novel grease gun for Tecalemit, Ltd., moulded by Injection Moulders, Ltd., was given the Silver Award. This gun, moulded of cellulose acetate, is a redesigned version of the old metal type, which had two principal disadvantages. It was too heavy for the average tool bag, and it was difficult to ascertain how much lubricant the gun contained. The new gun combines full visibility with lightness and minimum weight. Total weight of the "Visigun" is only 1½ oz.

The second container which attracted the judges' attention was a moulded cotton reel submitted by J. and P. Coats, Ltd., and moulded by Insulators, Ltd., of cellulose acetate, which was fully described in our April, 1939, issue. The reel is moulded in two halves, joined together with a central, hollow spindle. The thread is then unwound between the two outside flanges. One half of the container is transparent, so that the colour of the cotton can be identified. This unusual and extremely practical device was unanimously voted an Award of Merit.

It is interesting to record that the only two entries receiving notice were injection mouldings, which is an interesting reflection on their rapid development.

On the left is the grease gun for Tecalemit, Ltd., showing grease cups and cap moulded of cellulose acetate by Injection Moulders, Ltd. On the right is the moulded cotton reel, also of cellulose acetate, produced by Insulators, Ltd., for J. and P. Coats, Ltd.

Plastics for the Lecture Theatre

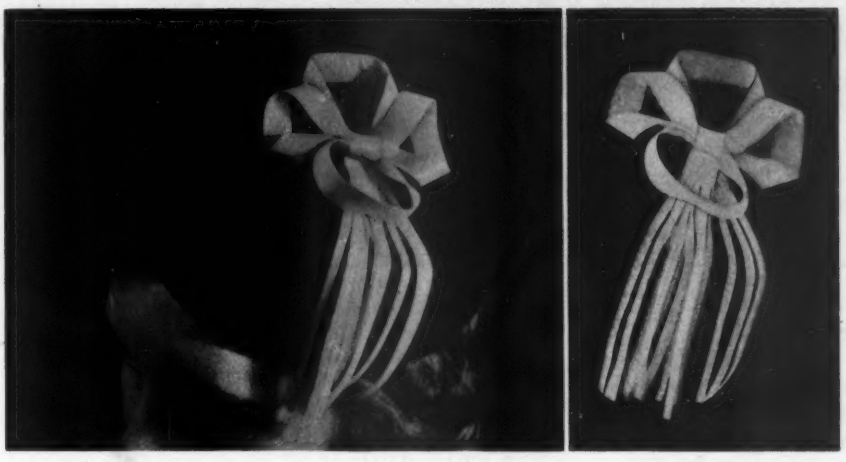
IN a paper read before the British Association at Dundee last September by Professor Frederic Bacon and reported in *Engineering*, September 22, the claim was made that when building simple models for the study of mechanism a considerable saving of weight can be effected by the use of plastic parts. For instance, the models of Kinematic chains, such as double-slider crank chains, etc., can be made sufficiently light and rigid to enable them to be picked up in one hand by any one of the Kinematic links of the chain, while the other hand is left free to operate the model. The use of plastics also enables a colour scheme to be employed in the construction of the models which is of value to the beginner.

Professor Bacon said that in light models of interest to students studying physics, cast and extruded sections of phenolic resinoids, as well as strips of laminated Bakelite, can often be used in place of brass. The specific gravity of such modern plastics is only about 1.3, i.e., half that of aluminium, or one-sixth that of brass. For models requiring small drawing boards, Professor Bacon recommends the use of Venesta Shuttaply, which consists of birch plywood 3-16 in. thick, the veneers being stuck together with a special thermo-setting adhesive which is quite insoluble in water.

Boards of this form, carrying pivoted links cut out of transparent celluloid and appropriately ruled, make it possible to plot curves of piston velocity and acceleration by standard constructions in two or three minutes.

Ideas—

By the EDITOR



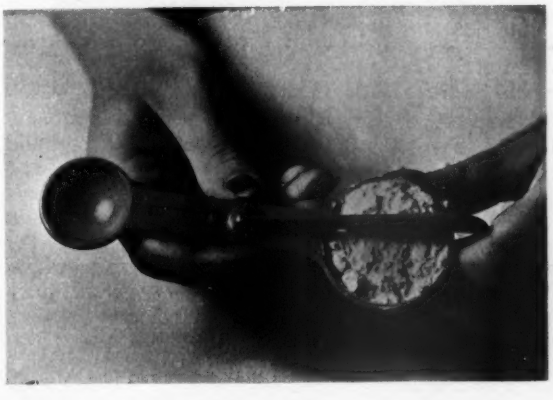
"Like a beacon to the sailor,
On the dark and troubled seas."

Cherchez La Femme

My note regarding my dog's luminous collar brought many interesting requests, and one very vulgar friend of mine said, "Very amusing, but why fake the photograph?" As if I should do such a thing! However, here's a genuine one. I've been able to get some luminous Polythene in the form of a tape from Mr. Hutton, of Hydro Plastics, Ltd. The other part of the family has made it into a hat decoration. The photograph on the right is a genuine one of the hat taken in complete darkness with an exposure of 10 minutes. Mr. Hutton tells me that he has sold considerable quantities to a Birmingham concern, Jarrett Rainsford and Laughton, Ltd., for making into flowers and similar decorations.

Mrs. Beaton Dies of Apoplexy

I have received the attached photograph of a new idea in plastics from the Monsanto Chemical Co., of Springfield, Mass. Every truly British or truly American woman should possess one! The accompanying note says, "When is a level teaspoonful level? Grandmother may have cooked by rule of thumb, but not to-day's smart housewife." Were my grandmother still alive, and she certainly did cook by what is called rule of thumb, Monsanto's publicity agent's ears would be burned to a cinder. If she deigned to teach him anything she would first tell him that cookery is an art ranking little lower than music or painting and is not an exact science involving the use of hypersensitive balances and slide rules. However, she would probably add with a ferocious gleam in her eye, "I agree that to-day's smart housewife needs one."



Consequently, there will probably be a large demand for these tea and tablespoon measurers. And, of course, they can also be employed for measuring out the correct quantity of arsenic oxide for giving one's husband his quietus, mixing porridge, examining one's larynx, etc.

They are manufactured from Monsanto cellulose acetate by Commonwealth Plastics Co., of Leominster, Mass.

Washing Machine Agitators

We have received advance information in general terms of the winning items of the plastics competition held by the well-known American journal, *Modern Plastics*. All these we hope, with the kind permission of our amiable friend the editor, Mr. Lougee, to discuss in a forthcoming issue of this journal. One of the winning items, however, struck me as being so important as to warrant immediate comment. It is a moulded washing machine agitator manufactured by the Star Equipment Corporation, of Bloomfield, New Jersey.

Washing machines in Great Britain during the first months of war are not exactly at a premium. We believe this industry and similar ones manufacturing utility machines for the household are suffering considerably owing to evacuation from big town areas and the temporary disorganization among what might be called the middle and upper classes. Nevertheless, the moulded agitator must be of importance to the washer manufacturer, for the ability to withstand corrosion against hot water and soap solutions is of primary importance. To-day the scarcity of metals weighs equally heavily in favour of plastics.

PRODUCTION

Practical Information dealing with Raw Materials, Moulding and Forming of all types of Plastics—Thermo-Hardening and Thermo-Plastic—Works-Organization, New Plant and Control Apparatus

NOTES AND COMMENTS

How Many Presses?

SUNDRY rumours are floating about the industry that make one sigh for the unification we have so earnestly prayed for, and which, for the benefit of the country, is so important in war time. It is reported, and we hope that there is not much truth in it, that "the majority of Government work of each Service is going to one or two large firms who seem to hold the monopoly, and, what is perhaps more important, new presses are being ordered."

To take these items separately. We do not know, of course, what quantity is meant by a majority of Government work, and few could answer that problem. For our part, we have fairly reasonable proof that almost every works we have visited during the past two months is doing some Government work; some do not care whether they have any or not and are working hard to retain their normal work, and there are even others who do not want it at all, saying that nobody is making any profit at all out of it. So you can take your choice.

It must not be forgotten that because certain outside industries have suffered very badly and are, indeed, in temporary oblivion, a few moulding concerns who specialized by working in close contact with these have suffered in consequence, and whole departments found themselves immediately without work. It is easily conceivable that in such cases immediate efforts are made to fill the presses with work of Government type, which can become the preponderant factor in the whole factory. We must express our sympathy for the moulding concerns whose work has largely been connected with the motorcar and electric sweeper industries, both of which are very badly hit. Such lack of work has its effect on the whole condition of the plastics industry.

As for the second item, it would, indeed, be a bit of a shock to the industry, considering it as an economic whole, were more presses to be installed without some effort to fill other existing and idle ones. The whole subject is a most painful one when considered completely objectively, and we can see that the problem involves the meddling in other people's business. It resolves rather in trying to decide whether or not the unification of the industry, and close co-operation and control within, is a desirable thing or not, and how far a system can be permitted to interfere with expansion of individual concerns within the industry. For that is certainly what it means.

Everybody within the industry knows that there are more presses in the plastics industry than are necessary for the work in hand. It is half the trouble that besets the industry. Nearly all the big moulders are efficient; nearly all the smaller ones are efficient within their capabilities. The tendency must be, we believe, that speaking by and large, the smaller firms are not able to carry out certain types of work, nor are they in a position to do much experimental work. The criticism by the big moulders of the smaller ones is often not as mild as this. Nevertheless, we firmly believe that the whole structure of the industry would be wrong were it to contain only large moulders. The main point to note is that the industry is a very efficient one on the whole, rather overloaded with presses.

Whatever the difficulties in the industry, it does appear that war time gives us a miraculous opportunity to create some unity of working, and to show the Government that here is an industry capable of helping in the conduct of the war; it has "x" number of presses, and the work can be divided up in an economical manner that will not interfere with such normal work as is being carried out. Although the total Government work given to the plastics industry is not very large, yet it is easily conceivable that this can rapidly increase as more uses are found for plastics. We do not want the normal business thrown completely out of gear.

There is thus a heaven-sent opportunity for the British Plastics Federation for improving the situation and for consolidating enormously its position after the war. We have often said harsh words of criticism against this body, but its power for good we believe to be great. It stands as representing the plastics industry in the eyes of the Government, and without it the industry would be in a parlous condition with regard to Government orders. It has rightly protected the industry by placing its workers on the protected list, a splendid piece of work that deserves the praise of members and non-members alike. But there would be little gratitude on the part of the industry if there were no work to occupy exempted workers. Then let us appeal to the Federation to distribute such work, if it comes within its power, more equably among members and non-members alike, always with the proviso that there is sufficient work.

It would be as bread cast on the waters.

Inquiries and Answers

"Tin Helmets"

Isleworth.

The Editor, *Plastics*.

Dear Sir,—With reference to your editorial in the October issue of *Plastics*, in which you mention the suitability of moulded helmets for members of the Civil Defence Forces, instead of the standard service pattern "tin" helmet, I will be very glad if you will inform me as to whether any firm has put such an article on the market, and, if so, the approximate retail cost.

K. G. ECHFORD.

[EDITOR'S NOTE.—The inquirer will be interested in the following information that Mr. H. H. Lusty, Controller of Publicity, Bakelite, Ltd., has been good enough to collect for me:—

"Harts, Ltd., of South Africa, must be credited with the initiative in developing the miner's hat in moulding material, although Mines Safety Appliances, of Philadelphia, have marketed a moulded impregnated hat for years past.

"Prior to the inception of the 'Hart' hat an aluminimum variety and a varnished paper pulp hat held the S.A. market. The metal hat was dangerous in electrified mines, and the paper pulp headgear quickly became 'soggy' in wet mines.

"Harts obtained their entry to the big mines by demonstrating how by crashing a Hart hat and an aluminium one together the metal hat collapsed; shortly afterwards the life of a native was saved by a Hart hat when a baulk of timber crashed on his head.

"Humpage and Moseley, Birmingham, made the first mould. To the best of our knowledge Bakelite moulding material X.199 (Pat'd.) has been used throughout."

As for the retail price, we have no information, although Mr. Lusty or the mould makers may have some.

For the inquirer's interest, we are including here a

photograph of a helmet manufactured by Mines Safety Appliances, of Philadelphia, and which was shown at Mr. G. N. Higgs's little exhibition at Dorland Hall in May, 1937. The particular helmet was made from a resin impregnated canvas or linen. Our complaint last month of the short-sightedness of the authorities in not manufacturing helmets of plastics for A.R.P., etc., instead of steel, is still further strengthened by the fact that sheet steel for making kegs and a hundred other things is more precious than gold.]

Cement-resin Mixtures

Riddings.

The Editor, *Plastics*.

Dear Sir,— Being a regular reader of your admirable book *Plastics*, I would like to take the liberty of asking your advice.

Could you be so kind as to tell me the best moulding powder (non-inflammable) that could be incorporated with a wet mixture of cement, etc., to be pressed and baked afterwards, with a view to strengthening the mix and giving it greater resilience?

Also, is there a plastic (also non-inflammable) that could be dissolved in boiled linseed oil, and so used for impregnating a dry porous mix? Would the mix have to be baked afterwards to harden the plastic?

If you would be kind enough to enlighten me on these points I should be very grateful, and any additional information would be greatly appreciated.

E. ISHERWOOD.

[EDITOR'S NOTE.—It is not quite clear what effect is really required by the reader. We doubt very much whether the inclusion of the ordinary thermo-setting resins would produce greater resilience to the mass. The only "resilient" cement we know is a material that was put on the market some years ago by Nordac Ltd., of Western Avenue, London, W.3, and which consisted of a mixture of cement or concrete and rubber. We remember seeing a sample of this—a sheet some 2 ins. thick—which was very flexible. Presumably, rubber emulsion was employed.

However, to return to the immediate questions. Moulding powder can be mechanically mixed with a wet mix of cement, but probably an emulsion of resin in water and mixed with dry cement would give better results. Without further heating, the resin does not harden permanently. On heating, it, of course, becomes permanently hard, but one can imagine that the heating of very thick pieces of concrete would have its own special difficulties. If properly cured, there would be no resilience in the finished product.

This type of work is already carried out with other raw materials. The bonding of iron filings, for example, for producing cores used in electrical work, entails the mixing of the metal particles with an alcoholic solution of synthetic resin, followed by a baking process. The inquiry bears also a resemblance to the manufacture of abrasive wheels in which phenol-formaldehyde resin is mixed with the ground abrasive. Both wet and dry mixings are utilized. The wheels are moulded in the cold under pressure, and then baked at about 170 degrees C. The resulting wheels are perfectly rigid.

The use of a synthetic resin contained in linseed oil could be carried out, but probably with very different results. Most modern varnishes are solutions in drying oils of oil modified phenol-formaldehyde, urea-formaldehyde or alkyd resins, and these can readily be made into emulsions. They harden, at least in part, by oxidation as well as polymerization. Here, again, heating to about 150 degrees to 170 degrees C. would bring about complete hardening, and the result would not be flexible. On the other hand, if the cement-varnish mix were allowed to harden in the cold, the finished object might retain some flexibility. But the hardening would take a very long time.

It may be that the reader refers to the impregnation of a cement form that has already set. Impregnation with a pure resin or a varnish would merely confer, say, waterproofing qualities to the mass, but not resilience.

On the whole, if the requirements are a "resilient" cement or concrete and a non-inflammable ingredient, we would suggest the mixing of the cement with an emulsion of the new rubber-like synthetics of the polyvinyl chloride or of the chlorinated rubber type. No baking is necessary. Inquiries regarding such emulsions should be made of I.C.I. (Plastics), Ltd., or F. A. Hughes and Co., Ltd. Mr. Norman Swindin, of Nordac Ltd., Dukes Road, Western Avenue, London, W.3, who has already carried out similar work, would be glad to give his advice.]

Pliofilm

Liston.

The Editor, *Plastics*.

Dear Sir,—We are sending you herewith a sample of "Pliofilm"—a product of Goodyears, the American concern. It is a transparent film made from a rubber derivative, which can be employed for the making of containers, the edges of which can be sealed by application of a hot iron on the seam. We should be glad to know if there is a similar material made in England.

L.J.N.

[EDITOR'S NOTE.—We have, of course, been acquainted with Pliofilm for the past few years. We do not believe there is an English manufacturer, although specially treated rubbers are available for purposes other than that in view. Pliofilm is sold in this country, although "Cellophane" cellulose film is more widely used.]

Moulded Stoppers

Leyland.

The Editor, *Plastics*.

Dear Sir,—We have sent to you under separate cover an aluminium icebag stopper, and should be obliged if you would let us know does anyone in the plastics trade, to your knowledge, mould goods which could be used in replacement of this aluminium article.

The latter is a German product, and we should be glad to find an alternative.

THE LEYLAND AND BIRMINGHAM RUBBER CO., LTD.

[EDITOR'S NOTE.—This should prove an excellent chance for the plastic industry to replace metal, although, of course, a material specially resistant to continual contact with water must be employed. From the moulding point of view there is no difficulty in the manufacture of the stopper itself and indeed the moulded job would be made in one piece instead of the two in which it is at present made. As for the screwed ring into which the stopper fits, a split mould may be necessary. Special care will have to be taken from the point of view of expansion and contraction, although the fluctuations in temperature from 0 degrees C., the melting point of ice, and normal temperature are probably not great enough to cause trouble.

Wheels for Taps

Stroud.

The Editor, *Plastics*.

Dear Sir,—We see by your current issue, page 309, that someone is looking for a make of handwheels for valves.

Our friends, Messrs. W. E. Amies, of Sheffield, have made these for years, and will doubtless be able to give you particulars. T. H. AND J. DANIELS, LTD.

Moulders Wanted

Fleet.

The Editor, *Plastics*.

Dear Sir,—I have a small sample of a plastic material which I should like moulded into semicircular shapes, not measuring over 2 ins.

I have the mould, and should be obliged if you could inform me of any moulding firm in London who would undertake this work for me.

It is simply a pressing-out operation, the particulars of which I could give. J. HARVEY.

[EDITOR'S NOTE.—Any of the moulding concerns in our directory would be glad to consider the matter.]

General.

R., Ltd., Glasgow. The inventor of Orobello is Mr. de Faveri, 23, Russell Chambers, Bury Place, London, W.C.1. The concern dealing with negotiations for his process is Bowker and Orford, Bush House, Aldwych, London, W.C.1.

E.M.S., Bournemouth. Makers of Beetleware:—British Industrial Plastics, Ltd., Argyll Street, London, W.1. The name Stadium probably refers to Stadium, Ltd., 75, Paul Street, London, E.C.2.

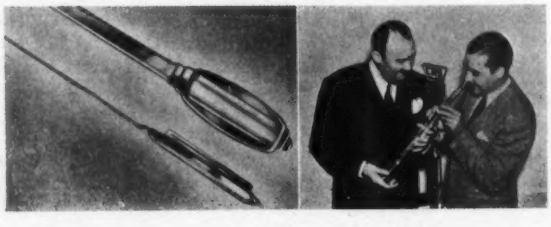
G., Ltd., Loughborough. The name of the moulders of the measuring stoppers described in the "Ideas" page of our October issue is Viscose Development Co., Woldham Road, Bromley, Kent.

E.A.D., Welwyn. The London agent for the Brabender Moisture Testing machine was Mr. H. K. Voss, 48, St. Maur Road, Fulham, London. The machine is German.

New Uses for Lucite.

Clarinets made entirely of Lucite methyl methacrylate resin, except for keys and mouthpiece holder of gold-plated metal, are now manufactured on special order by the Pedler Company of Indianapolis, Indiana. Musicians who have used these instruments say that the plastic gives a different tone, which some prefer to that of a metal instrument.

Another novel application of this well-known resin which makes full use of its amazing transparency is being exploited by an American manufacturer, K-D Manufacturing Company, of Lancaster, Pennsylvania. It takes the form of a rod-shaped lens which acts as a practical magnifier when fastened into the metal handle of a new letter opener.



TRADE AND PERSONAL NOTES

Monsanto Chemical Company, Plastics Division, Springfield, Massachusetts, U.S.A., have sent us a superbly produced catalogue dealing with their range of plastic goods, which should be of particular interest to the British industry at this time. Reference is made to Monsanto cellulose acetate moulding powder, sheets, rods and tubes, also cellulose nitrate and cast phenolic resin. It is also pointed out that Monsanto polystyrene moulding compound has now entered the injection and compression moulding field and is particularly suitable where lack of alcohol resistance or interference at radio wave frequencies has previously been a problem. The fact that Monsanto polystyrene can be moulded over a considerable range of temperatures from 320 degrees to 450 degrees F. gives it a marked advantage.

The following is a short list giving the properties of Monsanto polystyrene:—

Moulding quality ...	Good
Compression moulding temperature	approx. 325 deg. F.
Compression moulding pressure	3,000 lb. per sq. in.
Injection moulding temperature	340-450 deg. F.
Injection moulding pressure	1,000-30,000 lb. per sq. in.
Compression ratio ...	2.5
Mould shrinkage, inches per in.	0.002-0.0025
Specific gravity	1.05-1.07
Specific volume, cubic in. per lb.	25.9-27.8
Burning rate	Slow
Effect of age	None
Effect of sunlight ...	Yellows
Effect of weak acids ...	None
Effect of strong acids ...	None
Effect of weak alkalies	Crazes
Effect of strong alkalies	Crazes
Effect of organic solvents	Widely soluble
Colour possibilities ...	Unlimited
Light transmission ...	More than 90 per cent.

Kestner Evaporator and Engineering Co., Ltd., have sent us their leaflet No. 21 dealing with Keebush acid-resisting material. Particulars are given of the chemical and physical properties of Keebush and of types of Keebush equipment, including tanks, towers, pipes, valves, pumps, fans.

Crystalate, Ltd., inform us that their London offices, situated at 153, Moorgate, E.C.2, are now closed and that sales are being directed from their works at Golden Green, Near Tonbridge, Kent. Telephone number is Hadlow (Kent) 233.

British Thermostat Co., Ltd., have forwarded us their Bulletin No. 354A, which deals with thermostats for controlling the temperature of air in ducts of heating and air-conditioning installations in rooms, cold chambers and drying ovens, for use as immersion thermostats in vessels containing liquids.

Nordac, Ltd., Dukes Road, Western Avenue, London, W.3, inform us that they are now offering a highly specialized A.R.P. service for factory owners. By the use of a special rubber preparation, Nordac, Ltd., are able to render windows concussion and shock resisting and also to protect vital parts of chemical plant against excessive splintering.

Wm. Gardner and Sons (Gloucester), Ltd., Bristol Road, Gloucester, remind us that their streamlined combined patent Rapid Sifter and Mixer is finding many new uses in the plastics industry.

Dexine, Ltd., London, E.15, inform us that their products, Dexine and Dexonite, are used to an increasing extent for lining acid tanks where a high degree of protection is required.

"Plastics" Birmingham Office. On October 20 the Birmingham office of *Plastics*, at 61-65, New Street, was transferred until further notice to our Coventry office at 50, Hertford Street (Telephone No., Coventry 60095). As from the date mentioned, all communications for the attention of our staff in the Midlands must be sent to the Coventry address.

Edgar Allen and Co., Ltd., announce that their head office has been transferred to Eyam, near Sheffield, during the present emergency.

The Reliance Rubber Co., Ltd., Chelsea, London, S.W.10, have sent us an extremely well-produced brochure entitled "Plastic Gold," which deals with evolution of rubber as an industrial raw material. We understand that the publication of this fascinating booklet is in the nature of a birthday celebration, as quite recently the Reliance Rubber Co., Ltd., completed its 50th year of successful trading. There is a particularly fascinating chapter describing some very unusual uses of rubber which have been taken from the paper of Miss E. M. Pope, B.A., B.Sc. Naturally the use of rubber in the surgery stands high in the annals of science. On one occasion a Russian surgeon, Professor Smirnov, made use of a rubber heart in an operation on a sailor who had been stabbed through the heart. The natural heart was taken out, stitched up and replaced in the circulation and the electrically driven rubber heart substituted for it during the stitching.

Erinoid, Ltd., Lightpill Mills, Stroud, Glos, announce a fall in trading profits from £23,534 to £15,368 and total income from £24,284 to £15,503 in the year to July 31. Depreciation takes £6,703, against £6,690, and directors' fees £1,777, against £1,839, leaving £5,910, compared with £14,605. After providing £4,113, against £4,210, for tax reserve, writing off £3,206 from expenditure on development of new processes and paying a full year's Preference dividend, the carry-forward is reduced from £8,821 to £5,020. For the previous year an Ordinary dividend of 2 per cent., less tax, was paid. The issued capital of £330,000 includes £275,000 in Ordinary 5s. stock units, quoted at 2s. 6d.

Umbroc, Ltd., St. Helens, Lancs, has been registered as a private company with a nominal capital of £100 in 100 shares of £1 each. The objects are to adopt an agreement with the Lords Commissioners of the Admiralty and to carry on the business of manufacturers of and dealers in glass, chemical products, drugs, moulding powders and plastics generally.

Important Notice

IF your newsagent has not been in the habit of regularly delivering or reserving *Plastics* for you, you should, to save possible disappointment, immediately place an order with him instructing him to reserve a copy for you weekly. Newsagents' supplies are restricted owing to war-time conditions. They cannot, in these circumstances, be expected to anticipate casual demands. It is wise, therefore, while our present difficulties last, and to help the country in its economy campaign, to deal with the same newsagent and not depend on getting *Plastics* from other sources, where you may find your copy is reserved for some reader who has taken the precaution to order it.

Alternatively, the paper may be obtained direct from this office. A prepaid subscription for six months is 7s. 6d., including postage. Other periods pro rata.

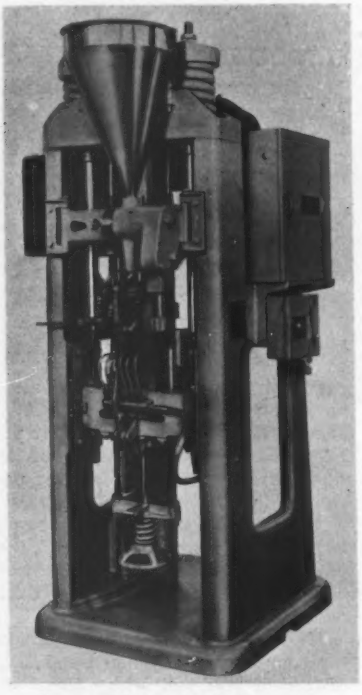
If you have any difficulty in obtaining your copy at any time we shall be obliged if you will let us know the name and address of your newsagent so that we can rectify the matter.

NEW MATERIALS—NEW PLANT—NEW METHODS

STOKES AUTOMATIC MOULDING PRESS

ANOTHER addition to the range of Stokes completely automatic moulding machines has just been announced. This is a large 15-ton-capacity 10-in. stroke machine for moulding thermo-setting plastics. Rated at 15 tons, it will produce mouldings requiring up to 18 tons pressure and mould parts up to 4 ins. high, 6 ins. length and 19 sq. ins. projected area. A feature of this machine is an adjustable bolster to reduce the length of ram travel and thus increase production rates on shallow work.

This new machine greatly broadens the application of automatic moulding, enables manufacturers to substitute low-cost plastic mouldings for die-castings, stamping, wood turnings, automatic screw machine products, etc. Single-cavity moulds are used and the machine, operating continuously, equals production rates of the large multi-cavity moulds used in conventional moulding methods. Output from one single-cavity mould is up to 10,000 or more pieces per week and proportionately greater when two or more moulds are used in the same machine.



Close-up of the new Stokes press, which is handled by Alfred Herbert, Ltd., Coventry.

It is pointed out that because single-cavity moulds can be made at minimum cost, changes in product design are economically practicable whenever desired, at little expense, also that mouldings are produced only as needed, not in the large quantities heretofore necessary to justify investments in multi-cavity moulds.

Like earlier models, this new machine is fully automatic, self-contained, electrically heated and powered, foolproof. It stops automatically and sounds a warning signal if a moulding fails to eject or the material hopper is empty. Since the element of human error has been eliminated, identical mouldings of highest quality are produced.

The machine is quickly set up or changed over from one job to another, is efficient on short-run operations as well as large-quantity production, requires no manual operating attention, handles all free-flowing thermo-setting materials.

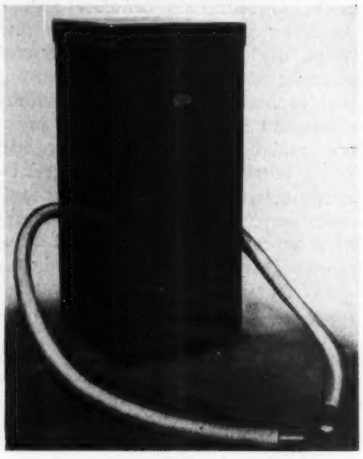
A New Model of the Phœnix Dust Extractor

AS a result of the success of the original Phœnix Dust Extractor, which has been so well received by the trade, a further model has been developed and is now being marketed by E. H. Jones (Machine Tools), Ltd., Edgware Road, The Hyde, London, N.W.9. The new unit, whilst having the same basic features as the original model, has been specially developed for use in the machining of what, for the sake of a better name, may be called fluffy materials, such as Bakelite, Erinoid and other synthetic products having a very light swarf.

In view of the special duties of the machine, it incorporates one major change as compared with the original general-purpose unit, in that the water trough has been replaced by a system of baffle plates and a canvas filter.

Operation and cleaning of the plant is extremely simple. A powerful fan with self-contained electric motor draws the container through a system of six baffle plates. After passing through these baffle plates most of the dust is deposited into the container and the finer dusts are then removed as the air passes out through a double or triple-canvas filter.

It should be noted that there is a further development of this same dust extractor consisting of the addition of a special dust-collection bag, which takes the place of the baffle plates and the canvas filter, and which is for use with extremely fine floury dust.



General view of the new model of the Phœnix dust extractor.

Cleaning the dust container is accomplished by removing the two wing nuts which hold down the cross-bar above the filter so that the top of the unit can be removed, and then the dust container is withdrawn through the front of the machine, as shown in the accompanying photograph.

The complete plant can easily be moved about the shop as it is mounted on four easy-running swivelling castors, and a strong handle is fitted on each side of the cabinet. Furthermore, the motor is accessible for greasing by removing the front plate seen at the lower front part of the cabinet, so that the whole unit is very easily handled.

The dust is withdrawn through the front of the unit.

OTHER TEMPLE PRESS JOURNALS

"THE MOTOR." The National Motor Journal. Every Wednesday, 4d.

"THE LIGHT CAR." The Specialised Journal for light-car owners. Saturdays, 3d.

"THE COMMERCIAL MOTOR." The Leading Journal dealing with Road Transport. Every Saturday, 3d.

"MOTOR CYCLING." The Original Motor Cycling Journal. Every Thursday, 3d.

"CYCLING." The Leading Cycling Journal of the World. Founded 1891. Every Wednesday, 2d.

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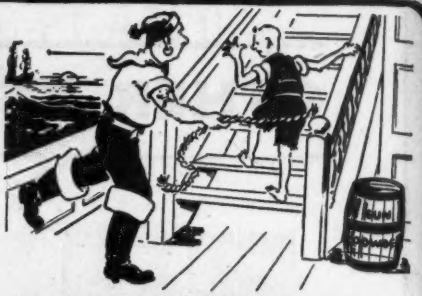
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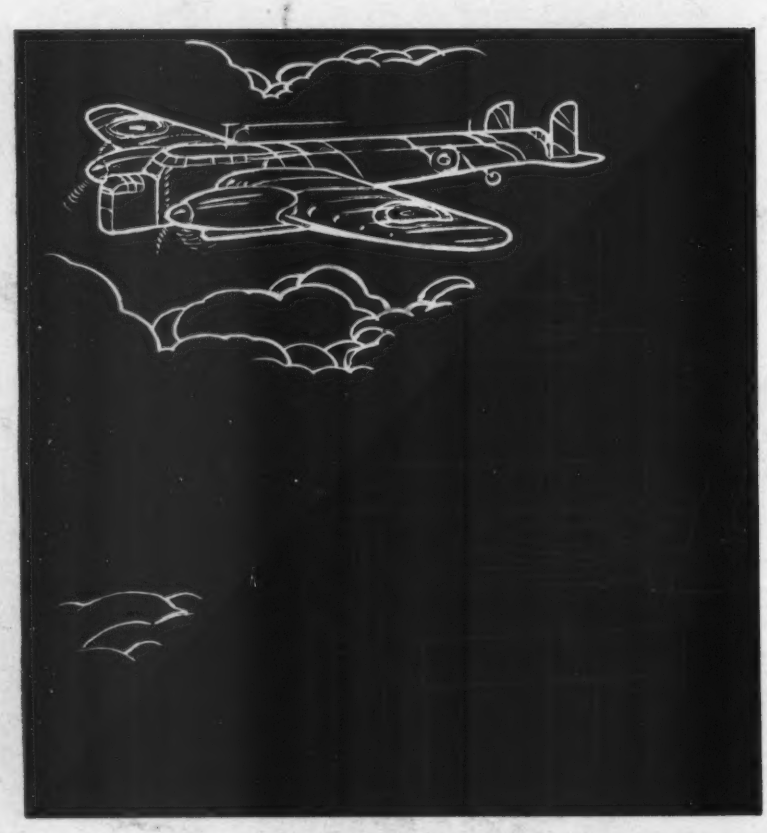

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